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Accountants:
Gilhoun & Steele, 20 Nassau street, N. Y. .. i
Air Brakes:
Wm. Loughridge, Baltimore i
Westinghouse Air-Brake Co., Pittsburgh i
Annual Meetings:
U. S. Rolling Stock Co., 74 Wall st., N. Y. i
Axles:
A. & P. Roberts & Co., Philadelphia v
Wilson, Walker & Co., Pittsburgh ii
Bolts, Nuts, Boiler Rivets, etc.:
Stokes & Townsend, Philadelphia vii
Books:
D. & P. N. Spon, 446 Broome st., N. Y. i
Bridges:
American Bridge Co., Chicago iv
Baltimore Bridge Co., Baltimore iv
Cincinnati Bridge Co., Cincinnati iv
Curt, Reeves & Co., Philadelphia iv
J. R. Cotrode & Co., Philadelphia iv
Delaware Bridge Co., 52 Wall street, N. Y. iv
Detroit Bridge & Iron Works, Detroit iv
Detroit Iron Co., Wilm. & 79 Liberty st., N. Y. v
E. P. Jones & Co., Milwaukee, Wis. iv
E. Hughes & Co., St. Louis v
Lindsay Bridge Co., Buffalo iv
Lindsay & Maurice, Athens, Pa. iv
Lyon Iron Bridge & Manufacturing Co., Cleveland. v
Keystone Bridge Company, Philadelphia iv
Lockport Bridge & Iron Works, Rochester v
Lockport & Henderson, Trenton, N. J. v
Louisville Bridge & Iron Co., Louisville iv
Niagara Bridge Works, Buffalo iv
Wrought-Iron Bridge Co., Canton, O. v
Bridge Bolts:
Hoskins & Gaylord, Cleveland —
Cars:
Birney & Smith, Manufacturing Co., Dayton, O. vi
J. G. Brill & Sons, Philadelphia xii
Harlan & Hollingsworth Co., Wilmington vii
J. M. Jones & Co., West Troy viii
John Stephenson & Co., New York —
Terre Haute Car & Mfg. Co. —
Car Seats:
Geo. Bustin & Co., Philadelphia ii
Car Heaters and Stoves:
Duke, Smith & Co., New York viii
Gardner Chilson, Boston —
Car Wheels:
Baltimore Car-Wheel Co., Baltimore ii
Barnum Richardson Co., Lime Rock, Conn. ii
Barnum & Richardson Manufacturing Co., Chicago. iii
Bowler, Maher & Brayton, Cleveland —
Clayuta Wheel & Foundry Co., Waverly, N. Y. vi
Ensign Manufacturing Co., Huntington, West Va. iii
John L. Gill, Columbus, O. iii
Hamilton Steeled-Wheel Co., Philadelphia ii
Lobdell Car-Wheel Co., Wilmington, Del. ii
Louisville Car-Wheel & Ry. Supply Co., Louisville vi
McKee & Fuller, Catasauqua, Pa. iii
Mowry Car & Wheel Co., Cincinnati vi
Rango Wheel & Foundry Co., Ramapo, N. Y. iii
Taylor Iron Works, High Bridge, N. J. ii
A. Whitney & Sons, Philadelphia iii
Checks:
John Robbins, Boston viii
Civil Engineers:
Clemens Herschel, Boston i
W. J. Nicolls, Baltimore i
Wilson Bros. & Co., Philadelphia i
Cordage:
Elizabethport Steam Cordage Co., N. Y. v
Cushioned Helve Hammers:
Bradley Manufacturing Co., Syracuse viii
Drilling Machines:
Thorne, DeHaven & Co., Philadelphia x
Duplex Tickets:
American Duplex Ticket Co., 800 Broadway, N. Y. vi
Employment vi
Engineering Instruments:
Heller & Brightly, Philadelphia xii
James Prentice, 164 Broadway, N. Y. xii
W. J. Young & Sons, Philadelphia xii
Excavators:
S. B. Alger, Long Island City, N. Y. ii
John Souther & Co., Boston ii
Files:
G. & H. Barnett, Philadelphia xii
For Sale:
Detroit Car Works i
Frogs and Crossings:
H. & H. Elliott, E. St. Louis, Ill. —
Hotels:
The Brunswick, Boston —
Hydraulic Jacks:
Richard Dudgeon, 24 Columbia st., N. Y. xii
Philip S. Justice, Philadelphia x
McCoy & Co., 134 Duane st., N. Y. —
Injectors:
National Tube Works Co., Boston xii
Wm. Sellers & Co., Phila. & 79 Liberty st., N. Y. xii
Iron Work for Contractors:
Edgemoor Iron Co., Wilm. & 79 Liberty st., N. Y. v
Iron Buildings:
Schweizer & Gruwe, 71 Broadway, N. Y. x
Journal Bearings:
Geo. R. Meneely & Co., West Troy, N. Y. vi
C. J. A. Dick, Philadelphia viii
Locomotives:
Baldwin Locomotive Works, Philadelphia vi
Brooks Locomotive Works, Dunkirk, N. Y. ix
Danforth Mach. Co., Paterson, N. J. ix
Dickson Mfg. Co., Scranton, Pa. viii
Hinkley Locomotive Works, Boston ix
Manchester Loco. Works, Manchester, N. H. ix
Mason Machine Co., Taunton, Mass. ix
National Loco. Works, Connellsville, Pa. ix
Pittsburgh Locom. & Car Works, Pittsburgh ix
Porter, Bell & Co., Pittsburgh ix
Rogers Loco. & Machine Works, Paterson, N. J. ix
Schenectady Loco. Works, Schenectady, N. Y. ix
Taunton Loco. M'f'g Co., Taunton, Mass. ix
Locomotive Balances:
T. S. Morton, 65 Elizabeth st., N. Y. —
Lubricators:
C. H. Parshall, Detroit vii
Machinists' Tools:
W. B. Bement & Son, Philadelphia —
Ferris & Miles, Philadelphia ii
E. Harrington & Son, Philadelphia viii
Wm. Sellers & Co., Phila. & 79 Liberty st., N. Y. xii
Mortising Machines:
Lane & Bodley, Cincinnati ii
Paint:
Iron-Clad Paint Co., Cleveland, O. vii
E. Maxwell & Co., St. Louis —
Prince's Metallic Paint Co., 232 Pearl st., N. Y. —
Quick-Stop Train Brake:
Wm. Loughridge, Baltimore. i
Rails:
Albany & Renss. Iron & Steel Co., Troy, N. Y. viii
Cambria Iron Co., Johnstown, Pa. viii
Cleve. Rolling Mil. Co, Cleveland, O. viii
Dana & Co., 20 Nassau st., N. Y. i
Edgar Thomson Steel Co., Pittsburgh viii
Geo. A. Evans, 74 Wall st., N. Y. i
North Chi. Rolling Mill Co., Chicago viii
Springfield Iron Co., Springfield, Ill. viii
Rail Fastenings:
American Ry. Supply Co., Pittsburgh v
Atwood Con. Lock Nut M'f'g Co., 40 Broadway, N. Y. v
Fisher & Norris, Trenton, N. J. —
Loomis Nut-Lock Washer Co., Cleveland v
Railroads and Transportation Lines:
Atlantic & Great Western x
Baltimore & Ohio xi
Chicago & Alton xi
Chicago, Milwaukee & St. Paul xi
Chicago & Northwestern xi
Chicago, Rock Island & Pacific xi
Cleveland, Col., Cinn. & Indianapolis x
Erie Railway Co. x
Empire Transportation Co. x
General Transatlantic Co. x
Illinois Central xi
Michigan Central xi
New York Central & Hudson River x
New York and New England x
North Pennsylvania x
Pennsylvania x
Philadelphia & Reading x
Philadelphia, Wilmington & Baltimore xi
Union Pacific xi
Wisconsin Central xi
Railroad Land Companies:
A. N. Kellogg, Chicago —
Railroad Manuals:
H. V. & H. W. Poor, 68 Broadway, N. Y. vii
Railroad Securities:
J. S. Kennedy & Co., 4 Cedar st., N. Y. i
Railroad Car Brake:
Wm. Loughridge, Baltimore. i
Rubber Steps:
Rubber-Step Manufacturing Co., Boston ii
Safe Deposit:
Safe Deposit Co., 140 Broadway, N. Y. i
Sash Chains:
T. S. Morton, 65 Elizabeth st., N. Y. —
Shafting:
Wm. Sellers & Co., Phila. & 79 Liberty st., N. Y. xii
Signals:
Hall Ry. Signal Co., West Meriden, Ct. i
Spikes:
Dilworth, Porter & Co., Pittsburgh —
Tudor Iron Works, St. Louis & Chicago. xii
Springs:
Columbia Car Spring Co., 223 Seventh ave., N. Y. ii
Culmer Spring Co., Pittsburgh ii
A. French & Co., Pittsburgh ii
Steel and Steel Tires:
Midvale Steel Works, Nicetown, Philadelphia xii
Thomas Prosser & Son, 15 Gold st., N. Y. x
Randall & Jones, Boston v
Standard Steel Works, Philadelphia x
Switches:
Pennsylvania Steel Co., Harrisburg —
Wharton R. R. Switch Co., Philadelphia i
Taps and Dies:
H. S. Manning & Co., 113 Liberty st., N. Y. viii
Ticket Punches:
L. O. Crocker, Weymouth, Mass vii
Track Tools:
Metcalf, Paul & Co., Pittsburgh v
Tri-Nitro Glycerine:
G. M. Mowbray, North Adams, Mass. vii
Turn Tables for Railways:
Wm. Sellers & Co., Phila. & 79 Liberty st., N. Y. xii
Valves:
Ludlow Valve Manufacturing Co., Troy, N. Y. ix
Peet Valve Co., Boston ix
Varnishes:
Berry Bros., Detroit x
Murphy, Sherwin & Co., Cleveland. xii
Forest City Varnish, Oil & Naptha Co., Cleveland. —
Valentine & Co., 323 Pearl st., N. Y. xii
Watches:
Giles, Bros. & Co. xii
Watchman's Time Detectors:
J. E. Buerk, Boston —
Weather Strips:
Pat. Metallic Weather Strip Co., 815 B'way, N. Y. xii
Welding Compound:
Schlerich Manufacturing Co. Jersey City ix
Wire Rope:
J. A. Roebling's Sons, Trenton N. J. —
Wrenches:
A. G. Coes & Co., Worcester, Mass viii
L. Coes & Co., Worcester, Mass. vii
Wanted and For Sale vi

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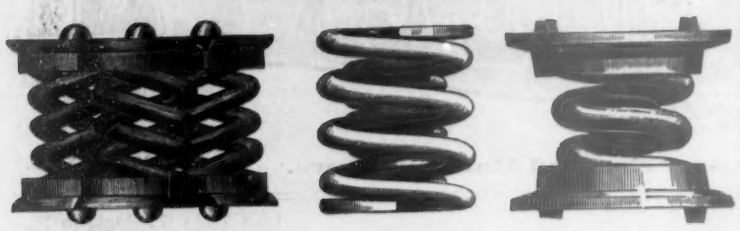

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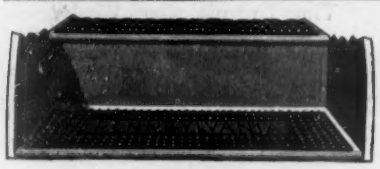

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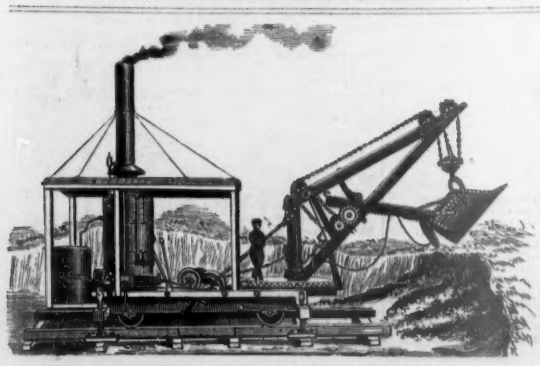

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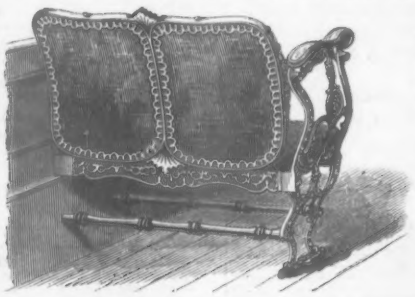

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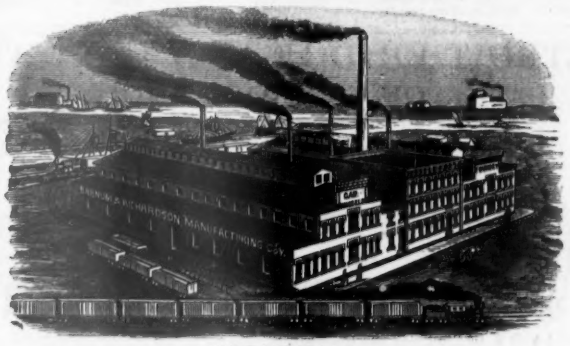

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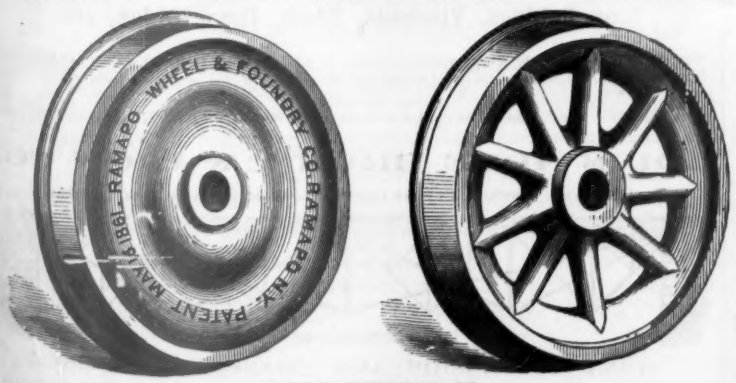

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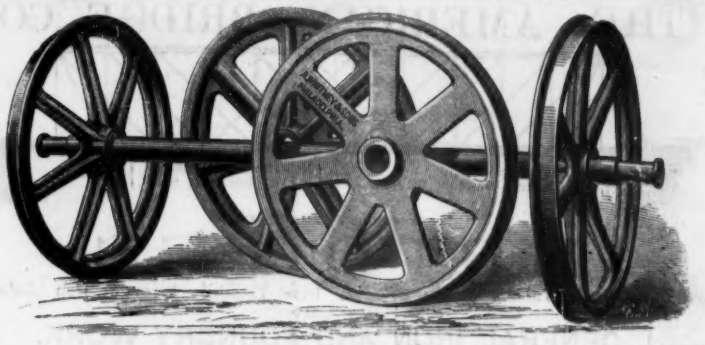

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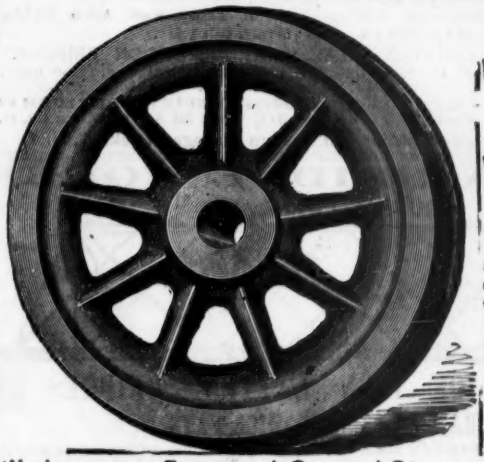

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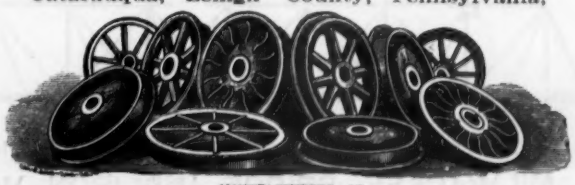

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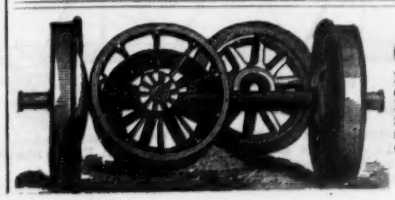

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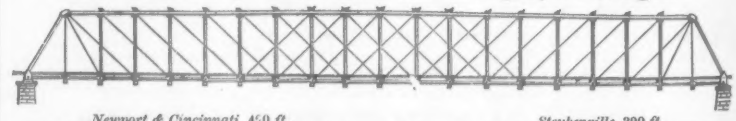

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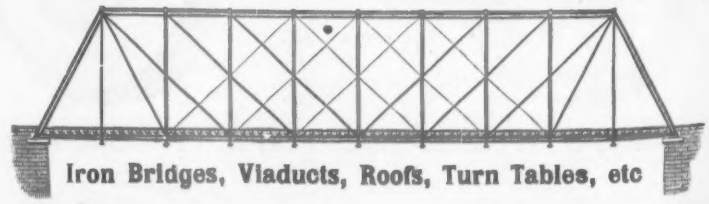

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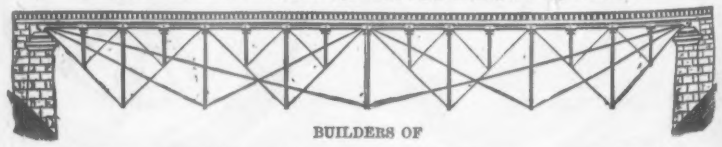

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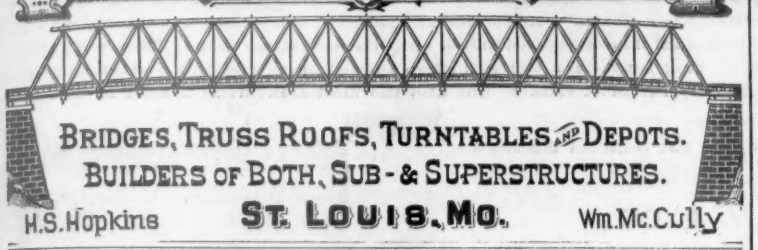

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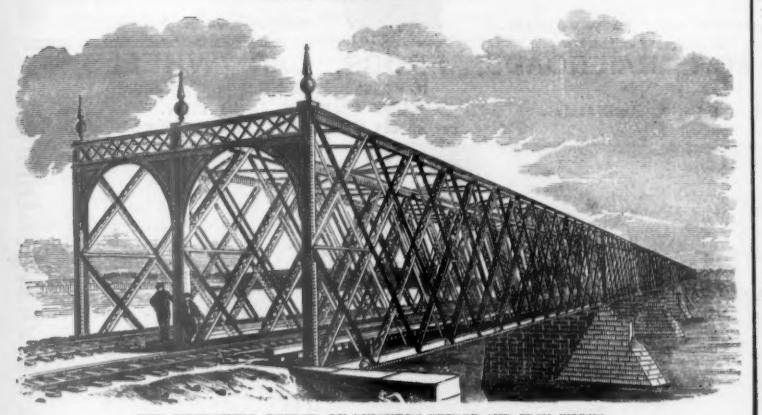

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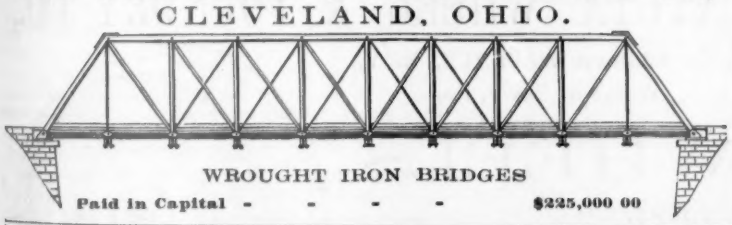

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This nut is represented in the engraving on the right, and is made of a conical form on the under side, and fits into the bolt hole which is made of the same shape. The cone and square portions are slotted so that when screwed up into the conical hole, the nut is compressed and clasps the bolt tightly, so that it cannot be shaken loose. The effect of wear is to make it fit the hole more accurately, so that when it is again tightened up it will be less liable to become loose than before it was worn. The conical nut is intended especially for fish plates and bolts.

The engraving on the left represents a square nut cut apart on the top side only. The under side is made concave, so that in screwing it up the hole on the upper side is contracted and clasps the bolt in the same way as the conical nut. The square nut is intended for car work bridges and similar purposes.

The conical nuts are now extensively used in the track of the Philadelphia, Wilmington & Baltimore and Boston & Albany, and have been applied on a number of other railroads. It is simple in construction, being in one piece, has a longer bearing on the bolts than other nuts, and cannot strip the threads, and will always fit the bolts, no matter how loosely the thread is cut.

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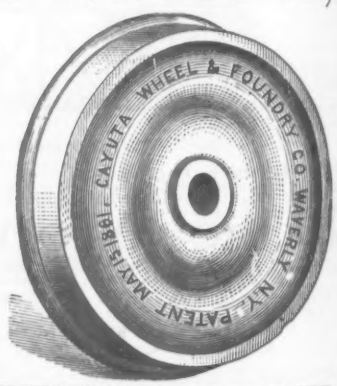

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RAILROAD GAZETTE

FRIDAY, JANUARY 19, 1877.

Record of New Railroad Construction in the United States in 1876.

We present below our usual annual record of new railroad construction. The brief description of each line is intended to make known as definitely as possible in a few words the location of each section of new road on which track was laid within the year 1876, whether such track was opened for traffic during that year or not. No account is taken of new second tracks and sidings, which usually form a large amount, but last year less than usual.

We have endeavored to make this record complete and exact, but doubtless some new construction has escaped our observation and inquiries. Last year our corrections added 77 miles to the mileage reported in the annual record Jan. 14. At the close of the description by States will be found a summary; and on the editorial page some comparisons and further statistics.

MAINE.

Bangor & Piscataquis.—This Maine railroad was extended in the fall from Abbott westward 8 miles to Blanchard, making it 63 miles long from its junction with European & North American at Oldtown.

New Brunswick.—The *Aroostook Branch* was extended during the year from Fort Fairfield, Me., west by north 12 miles to Caribou, making the branch 27 miles long, 17 of which are in Maine. It is of 3 ft. 6 in. gauge.

NEW HAMPSHIRE.

Boston, Concord & Montreal.—The *Fabyan Branch* was extended from Fabyan House eastward 7 miles to the foot of Mount Washington, making the branch 22 miles long from the junction at Wing road.

Hart's Location.—This branch of the Portland & Ogdensburg was completed in September from Lawrence Place, N. H., northward 2¼ miles; to carry lumber.

MASSACHUSETTS.

Fitchburg.—On the *Vermont & Massachusetts Division* a cut-off or loop 1.36 miles long has been built at Ashburnham, Mass., by which the reversing of trains at Ashburnham is avoided and a better connection made.

Martha's Vineyard.—This road was extended from Katama southward 1⅛ miles to the beach on the south side of the island of Martha's Vineyard, making the road 10 miles long. It is of 3-ft. gauge.

Old Colony.—The *Granite Branch* was extended from West Quincy, Mass., to Braintree, 2 miles.

RHODE ISLAND.

Narragansett Pier.—Completed from the New York, Providence & Boston at Kingston, R. I., east by south 9 miles to Narragansett Pier, a popular seaside resort.

CONNECTICUT.

Connecticut Central.—The *Rockville Branch* of this road was completed from the main line near East Windsor Hill eastward seven miles to Rockville, Conn., where it connects with the Hartford, Providence & Fishkill's Rockville Branch.

NEW YORK.

Elmira State Line.—Completed from a junction with the Northern Central Railway two miles south of Elmira, N. Y., west by south 19¾ miles to a junction with the Tioga and the Corning, Cowanesque & Antrim railroads at Tioga Junction, near Lawrenceville, Pa. It is intended chiefly to carry coal and is leased and worked by the Tioga Railroad Company, the two together being called the "Tioga & Elmira State Line Railroad." Of the road 6¾ miles are in New York; the rest in Pennsylvania.

New York & Canada.—The company constructed the *Rouse's Point Branch* from the main line at West Chazy northwest 14 miles to Rouse's Point, N. Y. It was completed in September, and serves for the through trains to and from Montreal.

New York, Bay Ridge & Jamaica.—Track was laid for three miles on this road, from New York Bay at Bay Ridge (just south of Brooklyn) eastward three miles to New Utrecht, connecting with a railroad to Coney Island.

Rochester & State Line.—Track was laid during the year from Leroy, N. Y., southwest 10 miles to Pearl Creek, making the road 35 miles long from Rochester southwestward, the other 25 miles having been built in 1874.

Rome, Watertown & Ogdensburg.—The *Lake Ontario Division* (formerly the *Lake Ontario Shore Railroad*) was completed in March by an extension westward 34¼ miles to Lewiston, N. Y., making it 146.2 miles long from Oswego to Lewiston. In January a line 1¾ miles long was completed in Oswego to connect the Lake Ontario with the Oswego Division.

NEW JERSEY.

Camden, Gloucester & Mt. Ephraim.—This road was extended from Gloucester, N. J., southwestward 3⅛ miles to Mt. Ephraim, making a line of 3 ft. gauge 6⅛ miles long from Camden.

Central, of New Jersey.—This company through an organization known as the Longwood Valley Railroad Company constructed the *High Bridge Branch* from a junction with the main line at High Bridge, N. J., north by east 21miles to Kenvil, with a branch from near German Valley to Chester, 3 miles.

Delaware & Bound Brook.—This road was completed in April from the Delaware River at Yardleyville northeast 27 miles to a junction with the Central, of New Jersey, at Bound Brook, N. J.; and in the fall the *Trenton Branch* of this road was completed from Trenton Junction northeast to Trenton, 4 miles. The main line is a section in the new through line between New York and Philadelphia.

Delaware Shore.—This road was extended from Paulsboro, N. J., southwest 15 miles to Pennsgrove, making it 20 miles long from its junction with the West Jersey near Woodbury.

Montclair & Greenwood Lake.—The road was extended from Monk's, N. J., north 6 miles to Greenwood Lake, a summer resort. This makes the road 41⅛ miles long.

Wallkill Lime & Cement Co.—This company constructed a railroad of 3-ft. gauge 2 miles long from Hamsburg, N. J., west to Hardiston, intended solely as a private railroad, and chiefly to carry limestone from the quarries to kilns.

PENNSYLVANIA.

Columbia & Port Deposit.—The track was laid from Columbia, Pa., southeastward down the left bank of the Susquehanna 10.8 miles to Safe Harbor in 1875 (but not chronicled that year). In 1876 the western section was extended down the Susquehanna 16.3 miles to a point half a mile east of Peach Bottom, and the eastern section was extended up the river 4.1 miles to a point one mile west of Conowingo, making a total of 20.4 miles completed in 1876, and making a total of 36 miles completed, leaving a gap of four miles to finish. Of the whole road 9 miles, and of the part built this year 4 miles are in Maryland.

East Berlin Branch.—Track is laid on 3 miles of this road between Red Hill and East Berlin, Pa., the whole length being seven miles, which is about ready for the rails.

East Brandywine & Waynesburg.—An extension known as the *New Holland Extension* has been completed from Honeybrook, Pa., westward 11 miles to New Holland, in the Conestoga valley. It is worked with the old line by the Pennsylvania Railroad Company.

Emlenton & Shippenville.—This is a road of 3-ft. gauge completed late in the year from a junction with the Allegheny Valley at Emlenton, Pa., northeastward 8 miles to Edenburg, in the Clarion oi region.

Parker & Karns City.—This 3-ft. gauge road was extended from Karns City southwestward 17 miles to Butler, Pa., in a most productive petroleum district. This makes the road 27 miles long, from Parker to Butler. The company making the extension was the *Karns City & Butler*, which has the same managers as the Parker & Karns City.

Peach Bottom.—The Western Division was extended eastward 4 miles to Delta., Pa., which is 35 miles east by south from York and not far from the west bank of the Susquehanna, leaving a gap of but two or three miles between the two divisions.

Philadelphia, Newtown & New York.—Completed from Erie avenue, Philadelphia, north by east 6 miles to Fox Chase.

Southwest Pennsylvania.—This branch of the Pennsylvania Railroad was extended from Watt, Pa., south by west 12 miles to Uniontown, making the whole branch 38 miles long, from its junction with the main line at Greensburg.

MARYLAND.

Wicomico & Pocomoke.—This road was extended from Berlin, Md., eastward 7 miles to Ocean City, making the whole line 30 miles long from Salisbury to Ocean City.

Worcester.—The road was extended in the spring from Stockton, Md., southeast 4 miles to Franklin, on Chincoteague Bay, completing a line 27 miles long, from Berlin to Franklin.

VIRGINIA.

Potomac, Fredericksburg & Piedmont.—This road, formerly the *Fredericksburg & Gordonsville*, and at the beginning of the year 18 miles long from Fredericksburg westward, has had 10 miles of track of 3 ft. gauge added to it by the Royal Land Company, which purchased it.

NORTH CAROLINA.

Chester & Lenoir.—This road was extended from Yorkville, S. C., northward 28 miles to Dallas, N. C., making the line 50 miles long from Chester to Dallas. It is of 3 ft. gauge. About 14 miles are in North Carolina, the remainder in South Carolina.

Raleigh & Augusta Air Line.—This road was extended late in the year from Cameron southwestward 29 miles to a point 86 miles from Raleigh.

Laurens.—This South Carolina Railroad had been abandoned several years, but in 1875 the South Carolina Railroad Company began to rebuild it, and the 15 miles of the track laid that year were extended 3 miles further in 1876, to Clinton, S. C. There remains 14 miles not yet rebuilt.

GEORGIA.

Northeastern of Georgia.—This road has been completed from the terminus of the Athens Branch of the Georgia Railroad at Athens, Ga., northward 40 miles to the Atlanta & Richmond Air Line at Lula. It was opened about September. It is of 3 ft. gauge.

Sandersville & Tennille.—This is a line four miles long from a junction with the Central Railroad of Georgia at Tennille, Ga., to Sandersville. It was opened for traffic Oct. 31.

MISSISSIPPI.

Natchez, Jackson & Columbus.—This road, which is of 3 ft. 6 in. gauge, was extended in 1876 from Corrie Creek northeastward 10 miles to Fayette, Miss., making it 26 miles long, from Natchez northeastward.

TEXAS.

Corpus Christi, San Diego & Rio Grande.—Near the close of the year a beginning was made of this road and 5 miles of track of 3 ft. gauge constructed from Corpus Christi, Texas, westward.

East Line & Red River.—Track has been laid on this road from Jefferson, Texas, northwestward 20 miles to Hickory Hill.

Galveston, Brazos & Colorado.—This company completed its first track in September, extending from Galveston, Tex., west by south 10 miles. It is of 3 ft. gauge.

Galveston, Harrisburg & San Antonio.—This road was extended from Kingsbury, Texas, westward 36 miles to the Cibolo River, leaving but six miles to be constructed to complete the road to its western terminus at San Antonio, 208 miles from its eastern terminus at Harrisburg, near Houston.

Gulf, Colorado & Santa Fe.—This road was extended 40 miles, making it 45 miles long, from Galveston, Tex., westward to Alcola.

International & Great Northern.—The main line of this road was extended from its late terminus at Rockdale southwestward 57 miles to Austin, Tex.

Texas & New Orleans.—This railroad was extended during the year from Liberty, Tex., east 68 miles to the Sabine River at Orange, making the whole line from Houston to Orange 108 miles. The new section takes the place of one completed before the war, but afterwards abandoned for many years and almost entirely destroyed.

Texas & Pacific.—The company completed its *Transcontinental Division* in August by laying 94 miles of track from the junction five miles south of Texarkana west to Brookston, whence the old part of the division extends it west to Sherman, 154 miles from Texarkana.

The main line was extended in July westward from Eagle Ford to Fort Worth, 26 miles, making it 253 miles long from Texarkana.

Texas Transportation Company.—This company has completed a railroad from Houston, Tex., eastward 7¾ miles to Clinton, on Buffalo Bayou, to be used in connection with an improvement of the Bayou which enables the New Orleans steamers to land at Clinton.

Texas & Western.—This 3-ft. gauge road, which was 6 miles long at the beginning of the year, from Houston west, has been extended westward 24 miles to Wemberly.

ARKANSAS.

Hot Springs.—This Arkansas 3 ft. railroad was completed into Hot Springs in February by the laying of 3 miles of track, making the road 21⅛ miles long from Malvern.

Little Rock & Fort Smith.—The road was completed by an extension from Altus, Ark., west by north up the Arkansas 48 miles to Cherokee, Ind. T., opposite Fort Smith. About two miles of the road are in the territory.

TENNESSEE.

Duck River Valley.—Track was laid from the junction with the Nashville & Decatur at Columbia, Tenn., northwestward 6 miles to Fountain Creek, out of 20 miles graded to Lewisburg. It is of 3 ft. gauge.

Tennessee Coal & Railroad Co.—This company's road was extended 1¼ miles to some new mines, making the road 22¼ miles long. It is of 5 ft. gauge.

KENTUCKY.

Cincinnati Southern.—On this railroad, which is nearly all ready for the rails between Cincinnati and Chattanooga, track has been laid from Cincinnati south 80 miles to Lexington, Ky., and then from Nicholasville, Ky., southward 10 miles to the Kentucky River, and from a point seven miles south of the Kentucky River southward 48 miles to a point two miles north of Somerset, Ky., being a total of 138 miles of new road in all; besides which it has renewed the iron on an old road for six miles south of Lexington which it bought to make part of its line.

OHIO.

Cincinnati & Eastern.—This road, of 3 ft. gauge, was completed from the Little Miami Railroad at Plainville, O., (9 miles north of Cincinnati) eastward 15 miles to Batavia.

College Hill.—This is a 3-ft. passenger line of a Cincinnati suburb, extending from a junction with the Cincinnati, Hamilton & Dayton to College Hill, 3½ miles.

Columbus & Toledo.—This entire road was completed during the year. The new track is 117 miles long, from Columbus north by west to Walbridge, Ohio, the track of the Toledo & Woodville road being used for the five miles from Walbridge to Toledo. The road was built chiefly as a northern outlet for Hocking Valley coal, and is under the same management as Columbus & Hocking Valley.

Dayton & Southeastern.—Completed in November from Xenia, Ohio, east by south 28½ miles to Washington; and at the close of the year 18 of the 19 miles of track between Xenia & Dayton were laid, but not in working order. It is of 3-ft. gauge.

Lake Erie, Alliance & Wheeling.—The track of this 3-ft. road was laid near the close of the year from Alliance, O., northward 14 miles to Palmyra.

Ohio Central.—This company, formerly the *Atlantic & Lake Erie*, has completed a line from coal mines at Moxahala, O., northward 8 miles to the Cincinnati & Muskingum Valley road at New Lexington, and from the same road at Bremen (12 miles west of New Lexington) north 28 miles to a junction with the Pittsburgh, Cincinnati & St. Louis at Central Ohio Crossing, 4¼ miles west of Newark.

Scioto Valley.—This road was completed June 1 to Chillicothe, O., 50 miles south of Columbus and 36 miles south of Lockbourne, the terminus at the end of 1875.

Springfield, Jackson & Pomeroy.—In the last week of the year 2 miles of track were laid on this new road, from Jackson, O., westward. It is of 3-ft. gauge.

MICHIGAN.

Chicago & Lake Huron.—A company called the *Chicago & Northeastern* completed in December the section of 46 miles from Lansing east by north to Flint, Mich., which gives this company an unbroken line 321 miles long from Chicago to Port Huron, 44 miles of the Pittsburgh, Fort Wayne & Chicago track being used from Valparaiso to Chicago. The new road is intended to work chiefly in connection with the Grand Trunk for through traffic.

INDIANA.

Anderson, Lebanon & St. Louis.—The first part of the road was completed in May, from a junction with the Cleveland, Columbus, Cincinnati & Indianapolis at Anderson, Ind., westward 20 miles to Noblesville.

Cincinnati, Wabash & Michigan.—This road was completed in May by an extension from Summitville south 18 miles, to Anderson, Ind., making the road 114 miles long from Goshen southward.

Indianapolis, Cincinnati & Lafayette.—Early in the year a branch of this road was constructed from Greensburg, Ind., southward 5¼ miles to some stone quarries.

St. Louis, Bloomfield & Louisville.—There was 6 miles of this

3-ft. gauge road completed at the beginning of the year, from Switz City, Ind., east to Bloomfield. In 1876 it was extended from Bloomfield southeast 29 miles to Bedford, on the Louisville, New Albany & Chicago Railroad.

ILLINOIS.

Chicago & Alton.—This company extended an old private railroad to a coal mine from its main line at Braidwood, Ill., west by north about 6 miles to Coal City, where it connects with the leased Chicago & Illinois River branch of the road.

Grayville & Mattoon.—The first part of this road, from Olney, Ill., on the Ohio & Mississippi, has been completed northward 20 miles to Newton.

Havana, Rantoul & Eastern.—This road was extended for 10 miles west of Rantoul, Ill., to Alvin, making it 40 miles long from the Chicago, Danville & Vincennes road westward. It is of 3 ft. gauge.

Rock Island & Mercer County.—This road was completed from a junction with the Peoria & Rock Island at Milan, Ill., (five miles southwest of Rock Island) southward 13 miles to Richland Grove.

WISCONSIN.

Chicago, Milwaukee & St. Paul.—In connection with its new bridge at La Crosse, Wis., this company constructed 2 miles of new railroad on the Wisconsin side.

Green Bay & Minnesota.—In September this company completed a branch from Onalaska on the Chicago & Northwestern's "Lacrosse, Trempealeau & Prescott" road southward 6¾ miles to La Crosse, Wis., giving a terminus in the latter city, to reach which it uses 23.2 miles of the last-named road from Marshland southward. Some trains of the Chicago & Northwestern also use the new branch.

Milwaukee, Lake Shore & Western.—An extension to connect this road with the Green Bay and Minnesota was completed late in the year from Appleton, Wis., west by north 21 miles to New London.

Wisconsin Central.—The *Portage Branch* was completed in the fall by its extension from last year's terminus at Plainfield southward 48 miles to Portage, Wis. The main line was extended on the south from Worcester north 34 miles to Butternut Creek, and on the north from Penokee south 12 miles to the Chippewa River. The gap between is but 10 miles long, south of which are the 198 miles to Menasha and the 71 miles of the Portage Branch, while north of it are the 42 miles to Ashland.

MINNESOTA.

Worthington & Sioux Falls.—This road was completed from Sioux City & St. Paul road at Worthington, Minn., westward 34 miles to Luverne. It was built by persons interested in the Sioux City & St. Paul and St. Paul & Sioux City roads largely to make a part of their land grant marketable.

IOWA.

Burlington & Northwestern.—This 3 ft. guage road was constructed from a junction with the Burlington, Cedar Rapids & Northern at Mediapolis northwestward 18 miles to Winfield; from Mediapolis southward to Burlington, 15⅞ miles, it uses the track of the Cedar Rapids road, on which a third rail has been laid to accommodate it.

Chicago, Rock Island & Pacific.—The *Oskaloosa Branch* was extended westward 9 miles to Oskaloosa, Iowa, early in the year, and in the fall was extended 24 miles further westward to Knoxville, making it 127 miles long from its junction with the main line at Wilton, most of the way parallel with and about 20 miles south of the main line.

Davenport & Northwestern.—This road (formerly the Davenport & St. Paul) has been extended 3 miles from East Davenport into the city of Davenport.

Iowa Coal, Railway & Manufacturing Co.—This company has built a branch from the Chicago & Northwestern at Boonesboro, Iowa, to its coal mines, 3⅛ miles distant.

Iowa, Minnesota & North Pacific.—This line has been completed from a junction with the Keokuk & Des Moines at Monroe, Iowa, northward 13 miles to Newton, on the Chicago, Rock Island & Pacific.

Sioux City & Pembina.—Completed from a junction with the Dakota Southern at Davis Junction, Iowa, (13.2 miles from Sioux City) northward up the left bank of the Sioux River to Portlandville, 16⅛ miles.

NEBRASKA.

Covington, Columbus & Black Hills.—This line, of 3 ft. 6 in. gauge, was completed from Covington, Neb. (on the Missouri opposite Sioux City, Iowa), westward 26 miles to Ponca.

Omaha & Northwestern.—The Missouri River line of this road was extended from Herman, Neb., northward 7 miles to Tekamah, which is 47 miles from Omaha. It was completed at the end of August.

Omaha & Republican Valley.—About the end of December this new road was completed from its junction with the Union Pacific at Valley Station, 35 miles from Omaha, west by south 19 miles to Wahoo, Neb., the county seat of Saunders County. It is to be worked as a branch of the Union Pacific.

MISSOURI.

Burlington & Southwestern.—During the year a section of road 26 miles long was completed from Browning, Mo., northward to the terminus of the northern division of the line six miles south of Unionville. This united the 23 miles from the Hannibal & St. Joseph northward to the 136 miles worked from Burlington southwestward, making a line 185 miles long from Burlington to Laclede.

St. Louis, Kansas City & Northern.—This company constructed a new entrance into St. Louis from Ferguson southeastward 11¼ miles to the Union Depot.

St. Louis, Keokuk & Northwestern.—This road was extended early in the year from Hannibal, Mo., southwest 26 miles to Louisiana, making the road 85½ miles long from Keokuk to Louisiana, and near the close of the year a further extension of 13 miles was made from Louisiana southeast to Clarksville.

Wyandotte, Kansas City & Northwestern.—The road was extended eastward 27 miles to Lexington, making it 42 miles long, from Kansas City eastward. It is of 3-ft. gauge.

KANSAS.

Joplin & Girard.—Completed from Girard, Kan., on the Missouri River, Fort Scott & Gulf road, east by south 20 miles to the coal fields in Baker township, Mo. It is primarily intended to make an outlet for the great lead mines at Joplin, Mo., 20 miles further east. About 14 miles are in Kansas.

Kansas City, Burlington & Santa Fe.—This road was completed early in the year from a junction with the Leavenworth, Lawrence & Galveston three miles south of Ottawa, Kansas, southwestward 13 miles to Williamsburg. It was built chiefly to reach coal mines on the line.

Missouri & Western.—This road (formerly the *Memphis, Carthage & Northwestern*) was extended near the close of the year from Brownsville, Kansas, west 28 miles to Oswego, on the Missouri, Kansas & Texas Railway. This makes the road 75 miles long from its junction with the Atlantic & Pacific at Pierce City, Mo.

Waterville & Washington.—Completed from Waterville, Kan., west 21 miles to Washington. It forms an extension of the Central Branch Union Pacific road, which extends 100 miles from Atchison west to Waterville.

COLORADO.

Denver & Rio Grande.—This company had begun an extension of its 3-ft. gauge road at the close of 1872 and had two miles laid south of Pueblo at the close of that year. In May this extension was completed 86 miles further south to El Moro, making the main line of road 206 miles long, from Denver southward. In June it completed a branch from Cucharas, Col., (170 miles south of Denver,) southwestward 22 miles to La Veta, on the way to the San Juan mining district.

Pueblo & Arkansas Valley.—This extension of the *Atchison, Topeka & Santa Fe* was extended from Rocky Ford westward 46⅓ miles to Pueblo, Col., there connecting with the Denver & Rio Grande. The Atchison, Topeka & Santa Fe now works a continuous line from Atchison west by south 619 miles to Pueblo, 137 miles of which, from Granada, is the property of the Pueblo & Arkansas Valley Company.

CALIFORNIA.

California Pacific.—The *Tehama Branch* was constructed from a junction with the main line at Woodland (56 miles north of Vallejo) northward 45 miles.

Central Pacific.—This company has completed a branch called the *Ione Branch* from the main line at Galt., Cal., eastward 28 miles to Ione City, where there are coal mines. The route is nearly the same as that of the Stockton & Ione project. It also constructed a new branch from Oakland Point to the State University grounds at Berkeley, 6 miles.

Nevada County.—This road was completed by an extension northward to Nevada City, Cal., 9 miles, making it 22½ miles long from its junction with the Central Pacific at Colfax. It is of 3-ft. gauge.

North Pacific Coast.—During the year this 3-ft.-gauge road was extended from Tomales, Cal., northward 30 miles to Moscow on Russian River, making the line 79 miles long from Saucelito, opposite San Francisco.

San Francisco & North Pacific.—The *Guerneville Branch* was completed by an extension of 9½ miles to Guerneville, Cal., on Russian River, making the branch 16 miles long from the junction at Fulton, 27 miles north of the San Francisco Bay terminus at Donahue.

San Luis Obispo & Santa Maria Valley.—This road, of 3 ft. gauge, was completed from the Pacific at Avila, Cal., to San Luis Obispo, 9 miles.

Santa Cruz.—Extended from Watsonville, Cal., to Pajaro depot on the Southern Pacific, 3 miles, making the road 23 miles long from Santa Cruz southeastward to Pajaro. It is of 3 ft. gauge.

Southern Pacific.—During the year the line was extended from the last year's terminus of the Tulare Division five miles south of Caliente, Cal., southeastward 114⅝ miles to San Fernando Tunnel, there connecting with the line to and through Los Angeles; and meanwhile the line east of Los Angeles was extended from White River southeastward 31⅓ miles to Indian Wells. Near the close of the year track was laid on a line from Goshen, the northern terminus of the part of the road east of the Coast Range, and at the point of junction with the Visalia Division of the Central Pacific, westward 50 miles to Grangeville.

South Pacific Coast.—This line has been wholly constructed within the year from Dumbarton Point, Cal., southeastward 15 miles to Santa Clara. It is of 3 ft. gauge.

SUMMARY.

MAINE.

	Miles.	
Bangor & Piscataquis	8	
New Brunswick—Aroostook Branch (3 ft. 6 in.)	12	
		20

NEW HAMPSHIRE.

Boston, Concord & Montreal—Fabyan Branch	7	
Hart's Location	2¼	
		9¼

MASSACHUSETTS.

Fitchburg	1½	
Martha's Vineyard (3 ft.)	1½	
Old Colony—Granite Branch	2	
		5

RHODE ISLAND.

Narragansett Pier	9	
		9

CONNECTICUT.

Connecticut Central—Rockville Branch	7	
		7

NEW YORK.

Elmira State Line	6¾	
New York & Canada—Rouse's Point Branch	11	
New York, Bay Ridge & Jamaica	3	
Rochester & State Line	10	
Rome, Watertown, Ogdensburg—Lake Ontario Division	36	
		69¾

NEW JERSEY.

Camden, Gloucester & Mt. Ephraim (3 ft.)	3½	
Central of New Jersey—High Bridge Branch	24	
Delaware & Bound Brook	27	
		54½
Forward		174⅛
Trenton Branch	4	
Delaware, Lackawanna & Western	2½	
Delaware Shore	15	
Montclair & Greenwood Lake	6	
Wallkill Lime & Cement Co. (3 ft.)	2	
		29½

PENNSYLVANIA.

Columbia & Port Deposit	16½	
East Berlin Branch	3	
East Brandywine & Waynesburg	11	
Elmira State Line	13	
Emlenton & Shippenville (3 ft.)	8	
Parker & Karns City (3 ft.)	17	
Peach Bottom (3 ft.)	4	
Philadelphia, Newtown & New York	6	
Southwest Pennsylvania	12	
		90½

MARYLAND.

Columbia & Port Deposit	4	
Wicomico & Pocomoke	7	
Worcester	4	
		15

VIRGINIA.

Potomac, Fredericksburg & Piedmont (3 ft.)	10	
		10

NORTH CAROLINA.

Chester & Lenoir (3 ft.)	14	
Raleigh & Augusta Air Line	29	
		43

SOUTH CAROLINA.

Chester & Lenoir (3 ft.)	14	
Laurens (5 ft.)	3	
		17

GEORGIA.

Northeastern of Georgia (3 ft.)	40	
Sandersville & Tennille (5 ft.)	4	
		44

MISSISSIPPI.

Natchez, Jackson & Columbus (3 ft. 6 in.)	10	
		10

TEXAS.

Corpus Christi, San Diego & Rio Grande (3 ft.)	5	
East Line & Red River	20	
Galveston, Brazos & Colorado (3 ft.)	10	
Galveston, Harrisburg & San Antonio	36	
Gulf, Colorado & Santa Fe	40	
International & Great Northern	57	
Texas & New Orleans	68	
Texas & Pacific—		
Main Line	26	
Transcontinental Division	94	
Texas Transportation Co.	7¾	
Texas Western (3 ft.)	24	
		387¾

ARKANSAS.

Hot Springs (3 ft.)	3	
Little Rock & Fort Smith (5 ft.)	46	
		49

INDIAN TERRITORY.

Little Rock & Fort Smith (5 ft.)	2	
		2

TENNESSEE.

Duck River Valley (3 ft.)	6	
Tennessee Coal & Railroad Co. (5 ft.)	1½	
		7½

KENTUCKY.

Cincinnati Southern	138	
		138

OHIO.

Cincinnati & Eastern (3 ft.)	15	
College Hill (3 ft.)	3½	
Columbus & Toledo	117	
Dayton & Southeastern (3 ft.)	46½	
Lake Erie, Alliance & Wheeling (3 ft.)	14	
Ohio Central	36	
Scioto Valley	36	
Springfield, Jackson & Pomeroy (3 ft.)	2	
		270

MICHIGAN.

Chicago & Northeastern	46	
		46

INDIANA.

Anderson, Lebanon & St Louis	20	
Cincinnati, Wabash & Michigan	18	
Indianapolis, Cincinnati & Lafayette—Branch	5¼	
St. Louis, Bloomfield & Louisville (3 ft.)	29	
		72¼

ILLINOIS.

Chicago & Alton—Coal City Branch	6	
Grayville & Mattoon	20	
Havana, Rantoul & Eastern (3 ft.)	10	
Rock Island & Mercer County	13	
		49

WISCONSIN.

Chicago, Milwaukee & St. Paul	2	
Green Bay & Minnesota—La Crosse Branch	6¾	
Milwaukee, Lake Shore & Western	21	
Wisconsin Central	94	
		123¾

MINNESOTA.

Worthington & Sioux Falls	34	
		34

IOWA.

Burlington & Northwestern (3 ft.)	18	
Chicago, Rock Island & Pacific—Oskaloosa Branch	33	
Davenport & Northwestern	3	
Iowa Coal, Railway & Manufacturing Company	3⅛	
Iowa, Minnesota & North Pacific	13	
Sioux City & Pembina	16⅛	
		86¾

NEBRASKA.

Covington, Columbus & Black Hills (3 ft. 6 in.)	26	
Omaha & Northwestern	7	
Omaha & Republican Valley	19	
		52

MISSOURI.

Burlington & Southwestern	26	
Joplin & Girard	6	
St. Louis, Kansas City & Northern	11½	
St. Louis, Keokuk & Northwestern	39	
Wyandotte, Kansas City & Northwestern (3 ft.)	27	
		109½

KANSAS.

Joplin & Girard	14	
Kansas City, Burlington & Santa Fe	13	
Missouri & Western	28	
Waterville & Washington	21	
		76

COLORADO.

Denver & Rio Grande (3 ft.)—		
Main Line extension	86	
La Veta Branch	22	
Pueblo & Arkansas Valley	46⅓	
		154⅓

CALIFORNIA.

California Pacific—Tehama Branch	45	
Central Pacific—		
Ione Branch	28	
Berkeley Branch	6	
Nevada County (3 ft.)	9	
North Pacific Coast (3 ft.)	30	
San Francisco & North Pacific—Guerneville Branch	9½	
San Luis Obispo & Santa Maria Valley (3 ft.)	9	
Santa Cruz (3 ft.)	3	
Southern Pacific	196¼	
South Pacific Coast (3 ft.)	15	
		350¾
Total for United States		2,442¾

The Duties, Responsibilities and Rightful Authority of an Accounting Officer.

[From a forthcoming work entitled "Railway Revenue and How to Collect it," by an accounting officer.]

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NECESSITY OF DEFINING THE DUTIES AND RESPONSIBILITIES OF THE ACCOUNTING OFFICER.

No man has ever yet been able to say with truth that he had fathomed the intricacies of railway management so that he had nothing further to learn. Railway management is a science, each of its branches possessing problems peculiar to itself, requiring for their elucidation years of thoughtful study and practical acquaintance; and much of this knowledge when acquired at the expense of so much time and patience cannot be taught or explained. Like the idioms peculiar to certain languages, it permeates the intelligence of the persevering student, but can only be made partly intelligible to those who seek for information through him.

The working organization of a great many of our railroads is exceedingly crude and ill digested in regard to the relations that the several departments bear towards each other. All power flows with the irresistible laws of gravitation into the hands of that department that possesses arbitrary power over the greatest number, and the overpowering influence of such a department destroys or weakens many salutary and necessary checks and safeguards.

It is a realization of the survival, not of the fittest (for all are alike necessary to a healthy and robust organization, but of the strongest.

To insure efficiency and prevent irregularities it is absolutely necessary that the checks and balances between the several branches of the service should be arranged with the utmost nicety and preserved, under all circumstances, without reference to men, with the most unyielding firmness. Whether this is true or not, let the weak and voiceless part borne by the accounting departments in our railways bear witness. What railway man is not personally conversant with acts of grave abuse that have had their origin in the neglect of salutary and proper checks; in the omission to define clearly and unmistakably the duties and prerogatives of minor officials; in the disposition of the aggressive, dominant faction upon every railway to treat with contemptuous indifference every officer that does not, at once, declare himself a henchman and a faithful servitor by prompt and respectful protestations of subserviency to that faction or manager?

How many accountants are there who, in the discharge of their duty of looking after the revenue of the company, have not had their efficiency destroyed or seriously crippled by the brusque interference of some local magnate, practically irresponsible?

How many companies are there that have not suffered colossal losses from the defalcations of agents, cashiers and paymasters in consequence of the stolid interference or inaction of those officials who, at best, can only be held to a general responsibility for the faithful collection of the revenue, but who arbitrarily dictate who shall and who shall not be employed?

How many accounting officers are there, of experience and character, who have not, from motives of common self-respect, been constrained to keep aloof and remain silent in consequence of the gross rudeness and marked disregard paid to their official suggestions in reference to agents known to be inefficient and untrustworthy?

How many millions of dollars have our railway companies lost from their neglect to fix the responsibility for the collection of receipts definitely and finally in the hands of the treasury department, with power sufficient to enable it to secure respect and enforce the general rule common to all lines, against the misappropriation of funds?

The treasury department should possess, from the highest source of power, the unquestioned right to enforce the dismissal of any agent who misapplies the company's funds; in such a case, the retention or dismissal of the agent should not rest in the discretion of the Superintendent.

The treasury department should possess the aribitrary power to dismiss a defaulting agent or official wherever found; the right to hire his successor, however, is not necessary to the faithful and efficient collection of the earnings of the road, and that duty can, very properly, be left to the discretion of the Superintendent.

An examination of the accounts of our railway companies would develop many surprising things. We should find, in many instances, that there was no recognized head, that each department or petty chief was permitted to introduce any special system or blank that pleased and to disregard any that displeased him; we should find each department striving to make its accounting independent of all others; we should find unnecessary elaboration of accounts in many of the departments; we should find that this elaboration proceeded, sometimes from ignorance, but generally from a disposition to show complete results, independently of the real accounting officer; we should find the details transcribed and retranstribed upon the books of several departments, when once should suffice; we should find systems without continuity or coherency; we should find men having the entire charge and control over the accounts of great departments, who knew nothing whatever about accounts; we should find men gravely assuming responsibility for the efficiency and economy of accounts, who owed their situation to the fact that they were good engineers, or efficient masters of transportation, or had the knack of buying cheaply; we should find that a division of authority destroyed responsibility, in accounts as in everything else; we should find, as a rule, whenever any great defalcation or mishap occurred, through the neglect, misconstruction or ignorance of these officers, that they escaped even the semblance of blame from the indisposition or inability of anybody to locate the blame; or in the occasional instances when it was definitely traced home to them, they lightly escaped on the ground that they were too busy to look after the accounts, or that they left the disposition of them mainly to subordinates, or that really they neither knew nor professed to know much about accounts; we should find that these same men who, in time of danger, broadly disowned any fixed responsibility in reference to the accounts, are always covertly intriguing to retain the arbitrary disposition of the accounts related to their several departments; we should find in the few instances where we discovered a compact organization, with a competent and responsible officer at the head, that, as a rule, he was harrassed incessantly by the innumerable petty chiefs who looked upon themselves as despoiled by him; we should find them exaggerating the cost of any system he introduced, disputing its efficiency, and making its chief the subject of petty slurs and innuendoes; we should find, in fact, that in the very field where the interests of our railway companies required great intelligence and fixedness of purpose, they possessed neither.

NECESSITY OF ORGANIZING THE ACCOUNTS UNDER THE DIRECTION OF A COMPETENT AND RESPONSIBLE HEAD.

Upon every railway a large percentage of the most intelligent and enterprising portion of the force are engaged, more or less, upon duties of a purely clerical nature. In the country at large there are probably a million of men identified with the department of accounts. We find them at every station, in each ticket office, at all the shops, upon every train, in each department office, and at the headquarters of the road. In each we discover hordes of men actively employed in connection with the accounts; many of them engaged wholly with such duties, while a large number are so engaged for a considerable portion of their time. The simplest and purest system that can possibly be devised is, to a certain extent, elaborate and complicated.

As a rule, every company may be said to possess a system of accounts in many respects peculiar to itself; not that there is any reason, inherent or otherwise, why it should be so. The system is usually a patchwork, largely dependent upon verbal instructions, poorly educated intelligence and the traditions of the road for the efficiency it possesses. No settled and clearly defined plans are anywhere accessible to the young and ambitious novice, and the experienced official frequently hunts in vain for any clue to guide him in matters that are new to him. The result is, that no positive advance is made towards perfection: the spirit governing the force, instead of being animated and alert, is depressed and without ambition.

It is undoubtedty true that there exists upon some roads a fixed purpose to mystify the processes by which certain results are arrived at; it does not, however, necessarily follow that there is anything wrong to be covered up. It may be because the accountant fears that a perfectly full and clear exposition of his system of accounts would render his services less valuable to his company. Little men dread competition: in the impenetrable gloom that surrounds the system of the average railway accountant, its author feels the power of a despotic Tappertit, and his efforts are directed to making himself more valuable because more indispensable to his patron.

More frequently, however, the system of accounts which we find, as we investigate the subject, is what we may term a conglomerate mass of makeshifts, possessing no continuity or coherence, the result of spasmodic effort, exercised at infrequent intervals, by different individuals or isolated department officers, without mature reflection or general consultation.

The instances are very rare indeed where one experienced, clear-headed and indomitable man has had such undisputed control and direction of the accounts of a railroad as to be able to mould them to his satisfaction, making them thoroughly homogeneous in their nature and effective in their application as a safeguard and a protection to the company whose affairs they record.

Our accountants should possess some accessible source of information in reference to all classes of railway accounts, perfectly definite and conclusive in its character. This means of learning placed within the reach of all, we would soon possess a splendid corps of intelligent, clear-headed men, systematically educated to perform the duties required of them. The result would be perfect precision in the work done, while much less time would be occupied in accomplishing any given result, as the labor of supervision and verbal explanation (the schooling process) would be unnecessary. These valuable results would naturally reduce the expense of accounting upon our roads, by greatly reducing the force, while increased efficiency would be secured in every branch of the service. The systematic education of our railway accountants will improve the class and character of the men, the incompetent will give place to the skillful, and we may ultimately expect to attract to the performance of these duties a class of men of high aspirations who carefully avoid professions where the appliances are so rude and indefinite, and where success, when achieved, is unrecognized, because possessing no substantial foundation that the world recognizes.

This branch of our railway service is, in the highest sense, important and honorable. The faithful collection and disbursement of the fabulous sums of money that pass through the coffers of our railway companies invite men of the highest ability, most resolute purpose, and incorruptible honesty; and when its vital importance is once clearly comprehended and the foundation of the system is made to rest upon some well-defined and substantial basis of intelligence, we may hope to see men of that character identify themselves permanently with the department.

No man who is not schooled in all the ramifications of a railway can comprehend the vital importance to every company that it should possess a rigid system of accounting with clearly-defined and well-established rules and regulations. The enforcement of these rules and regulations should be under the direction and control of an officer familiar with all the technicalities and subterfuges of railway accounts, possessing well-defined power with the fixed responsibility and duty of collecting and disbursing the receipts. It may be said that the system in force, although perhaps cumbersome and unskillfully regulated, nevertheless serves the purpose of making the results apparent. The colossal defalcations and petty thefts that blot the books of almost every railway company in the land are a sufficient answer to this oft-repeated and mischievous assertion. That our railway companies lose annually large sums of money from the causes named, is to be ascribed to the defective system of accounts they countenance, to the intermeddling of high officers in matters that should be left to be arbitrarily disposed of by the subordinate but really responsible officer, to the division of responsibility amongst several departments instead of fixing the responsibility definitely upon one, to an indisposition to adopt certain rules to be rigidly and universally applied where irregularities occur in the disposition of the company's funds, to an indisposition to enforce salutary rules when they are adopted, except in extreme cases.

NATURAL ANTAGONISM BETWEEN THE MANAGER AND THE ACCOUNTING OFFICER: NECESSITY OF SUSTAINING THE LATTER IN THE JUST PREROGATIVES OF HIS OFFICE.

The railway Superintendent and the railway accounting officer are natural enemies. In their duties one is positive, the other negative; one is aggressive, the other passive; while the former is energetically engaged in the performance of acts that leave an impress, that constitute railway history, in fact, and affect the material prosperity of the company in many ways, the latter, personally unconcerned as to the result, records with painstaking care all the acts and idiosyncracies of the Superintendent for the information of the direction. While we recognize the necessity that these officers should be perfectly independent of each other, we must not forget the relative strength and influence *naturally* possessed by each. Imagine an obscure and despised scribe, with hesitating and deferential air, sitting down in the presence of the commander-in-chief and his brilliant staff, to calmly and dispassionately write the history of a battle or a campaign, while yet the smoke of the conflict hung above the field; the position of the average railway accounting officer is that of the miserable scribe; wedded to an humble and obscure occupation, generally under-paid, patronized by men of consequence, dazzled with the glare and splendor of the immense power that is apparent round about him, he munches his crust with unaffected contentment, happy if he receive occasional recognition, and while he distrusts the future, yet is he unaffectedly grateful from day to day that he is permitted a little longer official life.

While no particular officer can, with justice, be said to serve more zealously than his fellow, yet each officer, in the particular field he occupies, may be presumed to be more familiar with the requirements of the service, and as a matter of pride, more unswervingly interested in seeing them carried out, than a brother officer whose attention and ambition are occupied with other matters. To the accounting officer or Treasurer, it is of vital consequence that the receipts of the company should reach the treasury even to the utmost farthing. His personal self-respect and recognition as an efficient officer are interested, a worthless balance standing against an agent is a slur and a reproach to him. If he is a worthy officer, he is conservative in his action; he desires to see the receipts of the company expeditiously collected and remitted, and when he discovers a man obstructing it, he wants that man promptly removed without reference to his sponsors, or any skill, real or fictitious, which he may be reputed to possess in some other branch of the service.

The Superintendent, on the contrary, is absorbed in his efforts to secure a good and cheap track, adequate equipment of a creditable character, the rapid and easy movement of trains, in the retention of agents capable of controlling men, or adepts in disposing of freight, or skillful in the handling of cars, or trustworthy in the manipulation of trains. The responsible and arduous nature of the duties he performs through his subordinates in the physical conduct of the business of the road renders him impatient of any attempt to change or disturb the machinery with which he conducts the affairs of the company, upon the efficacy of which depends his standing with the public at large. Being naturally a man of action, he is comparatively indifferent to all the mere details of the business. Whether the agent knows anything about accounts or not is a minor consideration. He esteems certain general principles to be important in connection with the collecting and remitting of the company's funds; but the literal and exact fulfillment of definite rules, a disregard of which would involve instant dismissal without reference to his feelings or wishes in the premises, is another matter entirely, and one that his habits of life, his convenience, comfort and natural antagonism all protest against. Like other men similarly situated he, as a rule, protests against the introduction or the enforcement of any rule that may, at any moment, propel him forward without any reference whatever to his wishes in the premises, and the contemplation of such an element in his official life disturbs and alarms him. The enforcement of a rule so purely impersonal would, without a doubt, frequently temporarily disturb the mechanism of the line, destroy for a moment one of the integral parts of an organization laborously erected; it would temporarily increase the Superintendent's burdens by necessitating the installation of new men and the re-arrangement of old men, for the reason that every new force injected into the life of a road has to be scrutimized until its utility and its general fitness are accurately ascertained. This labored process involves much discomfort to the Superintendent, and accounts, no doubt, for his great reluctance, frequently, to dismiss men unreliable as fiduciary agents but especially important to him in the evolutions of the physical life that occupies so much of his time and thoughts.

If our railway companies expect the simple duty of collecting and disbursing the receipts of the road, *i. e.*, the mere handling of the money, to be performed honestly, they must designate some particular official and make him responsible. He should be clothed with power requisite to make his position respected by subordinates everywhere. All of our roads possess such officials, in name, but as a rule they are practically the creatures of the Superintendent in this, that, by his injudicious interference, he destroys their usefulness and engenders in them a feeling of personal irresponsibility, arising partly from the consciousness that neither effective duty or common honesty can, in the nature of things, be maintained so long as no definite punishment is sure to be meeted out to offenders. The accounting officer or Treasurer then should possess the unquestioned right to remove a delinquent agent absolutely and finally.

It is a fact that neither the Superintendent nor any other single officer of a railway should be allowed any discretion whatever in reference to the reduction or dismissal of an employe caught diverting the revenue of the company to his personal uses: his dismissal should follow as a matter of course; and that it is not so to-day, upon every road, is because the manager has usurped a power and a discretion that do not rightfully belong to him, and that cannot with safety be intrusted to any one man. A man governed by so many contending considerations as a railway Superintendent, although an able, courageous and upright officer, is not equal to the exercise of so delicate and responsible a duty. Its abuse will follow as a matter of course, and instead of infrequent and isolated instances of unfaithfulness, the whole working force engaged in the collection of the receipts will be permeated with a feeling of irresponsibility. This feeling will find utterance in expressions and acts of contemptuous indifference to the wishes of the accounting officer and his officials, in inattention to any rigid plan of collecting the revenue, in a disregard of the rules governing remittances, in a retention of the company's funds, and in acts of malfeasance disgraceful in the extreme, the panorama of lawlessness finding a temporary conclusion from time to time in the offering up of some subordinate and comparatively inoffensive official as a vicarious sacrifice.

Contributions.

Brake-Shoes—Their Influence upon the Life of Car-Wheels.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have been much interested by reading from time to time the articles and discussions which you have published upon the subject of the mileage of car wheels.

Among the theories upon the subject which have been advanced, I do not remember, however, that any notice has ever been taken of the probable effects of the material of the brake-shoe upon the life of the wheel, and yet there is in the subject food for very serious reflection, not only upon the part of railway managers, but also on that of wheel-makers.

All workers in cast iron are familiar with the fact that a certain proportion of scrap put into a casting will destroy the edge of a tool as quick as a grindstone, no matter how well the tool may be hardened or tempered, and is it not therefore likely that a hard brake-shoe may have the effect of reducing the mileage of a wheel in such ratio as the hardness of the metal in the shoe may bear to that in the tread and flange of the wheel?

Now take into consideration the fact that the refuse of the scrap heap is used for the making of brake-shoes, that nothing in fact is too poor or too hard, so long as it can be brought into a sufficiently fluid condition to run into the mould, and what chance is there that the brake-shoes in common use are of that degree of softness which will enable them to do their work without destroying the wearing face of the wheel and flange, as must follow quickly when the shoe is perhaps harder than the chill upon the wheel itself.

A case illustrating this came under the writer's observation some years since. A brake-shoe had been made by combining wrought and cast iron, a rectangular piece of wrought iron, having holes punched through it at such angles as would permit it to be held securely by the cast iron, was placed in a mould and cast iron used to complete the shoe, thus giving a shoe with the face principally of wrought iron and the back of cast iron, with the necessary hook arrangements for attaching to the brake-block.

By this mode of construction the cast iron presented itself at the face side of the shoe, though the holes which had been punched into the wrought-iron plate, and in a service trial it being observed that the tread of the wheel was wearing unevenly, an examination disclosed the fact that grooves were being formed upon the tread coinciding with the position of the plugs of cast iron appearing through the wrought iron upon the face of the shoe. The shoe having been taken off and broken, it was found that at all points of contact between the wrought and cast iron the latter had chilled, thus giving several points upon the face of the shoe admirably adapted to the purpose of reducing the life of the wheel.

If this subject was more closely investigated than it seems to have been, the differences in the mileage of wheels—running all the way from 15,000 to 90,000 in wheels of the same makers, and presumably of the same material—might in some measure at least be accounted for.

From these premises I would argue that the use of wrought iron for brake-shoes would be attended by such results economically as would amply justify the expense involved in making such change. Many of the leading railways of the country are and have been using it with satisfactory results for years, and it would be interesting to compare wheel records of such roads with the records of the roads using cast-iron brake-shoes of all degrees of hardness.

By the use of wrought iron a soft material for wear against an extremely hard one is obtained, with the *great advantage of uniformity*, which cannot be obtained in cast iron so long as the poorer qualities of scrap are used for shoes, and the stubs of these inferior shoes again recast for the same use.

Would not it be fair that the wheel-maker, when asked to give a guarantee for mileage, should in return ask a guarantee that no material should be used for wheel-shoes against those wheels which should be quite as hard as the tread of the wheel?

For effective braking, the pressure applied to the wheels through the brake-shoes should be equal to the weight of the car with its load. Divide this pressure by eight, and estimate the effect produced by it when communicated through a hard brake-shoe upon a surface traveling at the rate of thirty to forty miles per hour, and it may be found that this effect has a very important bearing upon the general subject of wheel mileage.

C. M. W.

Examining the Ashtabula Bridge.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your editorial on the Ashtabula disaster (paper of Jan. 5), you allude to a report that the bridge in question was designed by "John Towlinson." The name should, I judge, be "Joseph Tomlinson;" and if the bridge was proportioned by him, the chances are very great in favor of the conclusion that it was knocked down by a portion of the train being derailed and driven against the truss. Mr. Tomlinson, who was afterward one of Mr. Channte's assistants on the Kansas City Bridge, is from my personal knowledge a most careful and conscientious worker, and not at all likely to have permitted any bad workmanship or material, or insufficient sections, to have escaped his inspection.

As you correctly observe, it is of the utmost importance that the removal of the wreck should take place under the eye of an expert, in order that the lesson be not lost. An examination and report to your paper from either Mr. Willard Pope, of Detroit, or Mr. Simeon Sheldon, of Cleveland, would be a thoroughly reliable mode of getting the correct facts of the case before your readers and for the judgment of the profession, if either of these gentlemen can be induced to undertake it. If Mr. Tomlinson is still living (I have not heard of him for several years), he will doubtless respond to a request for the strain sheet and floor system of the structure.

The average coroner is fully equaled in technical acumen by the average railroad trainman. I remember on one occasion seeing a number of them trying to ascertain how some broken cross-ties caused the fall of a truss, when the entire tensile and main compressive system of the bridge was unbroken, except a sheared end post which lay before their eyes mixed up with an axle and pair of wheels bent around it like an ox-bow, and the track of that particular truck, derailed for 1,050 feet back of the bridge and leading directly to the end post (a 24-in. Phœnix column), which it had cut in two, could be traced over the cross-ties and embankment for every foot of the way. In the light of this reminiscence, I suggest that you endeavor to obtain the report of an expert on the relative positions of train and bridge as the wreck is removed, in order that a correct judgment may be formed.

C. SHALER SMITH.

Discussing Locomotive Accounts.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In view of the fact that there exists so great a difference in the system of keeping the accounts of the locomotive department as to make comparison of expenses, as shown in monthly reports, almost valueless, I have thought that at the next convention of master mechanics the matter might be taken up by them and the basis of some general system arrived at. We only know by comparison how our expenses are running, and unless some general system prevails the attainment of the knowledge as given in our reports becomes almost entirely useless. You would oblige me, and do the service a benefit, by agitating the subject in some one of your early issues.

AUDITOR.

Train Despatching.

QUINCY, Ill., Jan. 9, 1877.

TO THE EDITOR OF THE RAILROAD GAZETTE:

On the night of Jan. 1, Conductor Gage, running an extra Wabash train, applied at the telegraph office at Quincy Switch for "orders." The following from the train despatcher at Galesburg was given at 9:40 p. m.: "Run to Camp Point wild, regardless of T., W. & W. No. eleven (11)." The usual signatures and understanding were also given.

The track from Quincy to Camp Point is leased by the Wabash Railway from the Chicago, Burlington & Quincy Railroad, and all trains on that track are under control of the Chicago, Burlington & Quincy despatcher at Galesburg. At 9:45 p. m. passenger train Chicago, Burlington & Quincy No. 101 was due at Quincy, but Gage and his engineer, both of whom were "new" to this end of the road, pulled out against that train, had a severe collision, killing poor Gage and Stiner (one of the brakemen) and severely injuring several others. It is admitted by all, that according to the orders and the time card, the extra had no right to leave as it did. There is, however, a considerable difference of opinion regarding other facts connected with the disaster. Some claim that the order was simply a trap to catch the unwary or the ignorant, and say that if the words, "After the arrival of C., B. & Q. No. 101" had been prefixed to the order it would have been perfectly safe, *and was not a safe order without*, thereby making the despatcher *morally* responsible for the so-called accident, proving their claim by the assertion that had the telegraph for the time been laid aside, thereby compelling the train-men to rely entirely upon their card, the accident would not have happened.

In the train order, the attention of the men was called to but one train, entirely overlooking the other. Is it any wonder that a conductor who had never run a train out of Quincy should have depended entirely on the order, without consulting the card?

It does seem that, as far as possible, the system of telegraph orders and the time card should be kept as separate as possible, using both only when absolutely necessary. For months every train on this end of the Chicago, Burlington & Quincy Railroad, whether on the card or not, has been compelled as an additional safeguard to ask for and receive orders before leaving Quincy, and right in the face of these additional safeguards a train crew ride down to death.

We respectfully refer the above to your consideration, feeling assured that if the matter is worthy of your attention you will take such means as will tend to make the system of train despatching less dangerous to the despatched.

E. C. CENTRIC.

The Ashtabula Accident.

The examination into this disaster seems likely to be more thorough than is usual in such cases. The Coroner at Ashtabula has taken advice from engineers, and already there has been considerable testimony from experts, including Mr. Joseph Tomlinson, who made the original design for the bridge, Mr. E. A. Beebout, Chief Engineer of the Canton Bridge Company, Mr. A. Gottlieb, Engineer of the Keystone Bridge Company, Mr. George M. Reid, Superintendent of Bridges of the Lake Shore road, Mr. A. L. Rogers, inspector of bridges on the division, including Ashtabula, and others; and the inquest is still progressing. Mr. Rogers, the bridge inspector, was on board of the wrecked train.

The following is from a report of the testimony of Mr. Tomlinson published in the Cleveland *Leader:*

"He made the drawings for the iron Howe truss bridge over the Ashtabula Creek, the one which has lately fallen. He did this under instructions from Mr. Stone. He never approved of a wrought-iron Howe truss over a large span; it makes an unnecessarily heavy bridge, and all the strains accumulate on the end braces; notwithstanding its weight it would have been a strong, durable bridge had the main braces been sufficiently strong; they were not made as large as designed, and it was his intention they should be strengthened, but his connection with the company was severed on account of a difference that arose between himself and Mr. Stone concerning the bridge; he thought the main braces were the only defective part of the bridge; this was the only defect that he was aware of, except its unnecessary weight; he thinks it would have been an exceedingly strong structure had it not been for these defects. Mr. Collins had nothing to do in any way with the bridge, to his knowledge; the bridge was calculated to carry a moving load of from two to three tons to the lineal foot; he was dictated to in making his plans for this bridge by Mr. Stone; if the irons had all been good, and wrought according to the patterns and placed in their proper positions, he thinks the bridge would have been perfectly safe. In the original plan made by Mr. Tomlinson, the main braces were calculated to bear a pressure of four tons to the square inch; he was informed what alterations had been made in remodeling the bridge; he thinks that a pressure of four tons to the square inch on these braces would have caused lateral deflection; he proposed a method of strengthening the defective braces to Stone, which he, Stone, would not listen to, and became angry. It was in consequence of this difficulty that he resigned his situation. Mr. Tomlinson never had any anxiety except about the braces. He don't think a better set of rods or chords were ever put into a bridge."

After giving this testimony Mr. Tomlinson examined the wreck of the bridge and testified, having been recalled, that he "found evidence on the angle-blocks that some of the braces had slipped out of place before they were last painted, some of them as much as five inches. The braces should have been so fastened to the angle-blocks that this could not have happened."

Mr. Beebout testified that he found that the braces were attached to the angle-blocks in an unsafe manner, and that some of them had slipped out of place. He found some of the braces with the ends slipped away to accommodate the tension rods, reducing their area of section. He thought this a very material injury to the structure.

Mr. Gottlieb's evidence we find very blindly reported. He said that the Superintendent of the road (Mr. Paine) told him that he should have every facility possible to enable him to carry out his investigation. His principal objection to the bridge was "its great unnecessary dead weight," which he calculated to be 3,000 to 3,200 lbs. per linear foot.

Mr. Reid, the Superintendent of Bridges of the road, who had had 25 years' experience with bridges, had always thought the bridge safe, and was perfectly familiar with it. It was examined critically last September. Only trifling repairs had been required.

The bridge inspector, Mr. Rogers, was accustomed to examine the bridges between Cleveland and Erie four times a year. He inspected the Ashtabula bridge in October or November, and found only a nut out of place.

Mr. Slataper, Chief Engineer of the Pennsylvania Company, is reported as having said that he thought the bridge generally was a good structure, but not broad enough for its height.

Besides the coroner's inquest, the State of Ohio is to make an examination into the accident, and there seems a reasonable prospect that the facts in the case will be made known.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

Michigan Central.—Mr. A. G. Dailey has been appointed Superintendent of Track and Bridges, with office in Niles, Mich.

Wabash.—The board has elected Jas. A. Roosevelt, President; Henry Crawford of Chicago Counsel; Jas. A. Roosevelt, Solon Humphreys, J. S. Kennedy, H. A. V. Post, John F. Martin, Executive Committee.

Boston, Clinton, Fitchburg & New-Bedford.—Mr. Isaac N. Marshall, Agent at New Bedford, has been appointed Superintendent of the New Bedford Division, in place of Mr. Warren Ladd, resigned.

St. Louis, Vandalia & Terre Haute.—At the annual meeting in Greenville, Ill., Jan. 9, the following directors were chosen: Thomas A. Scott, Philadelphia; Thomas D. Messler, Pittsburgh; W. R. McKeen, W. K. Edwards, Terre Haute, Ind.; Robert L. Dulaney, Marshall, Ill.; W. S. Smith, A. G. Henry, Greenville, Ill.; Otto Brodtbeck, Highland, Ill.; J. S. Peers, Collinsville, Ill. The board subsequently organized by electing Thomas D. Messler, President; W. H. Barnes, Treasurer; Williamson Plant, Secretary. The road is leased to the Terre Haute & Indianapolis Company.

Rutland & Whitehall.—At the annual meeting in Fair Haven, Vt., Jan. 4, the following directors were chosen: W. W. Cooke, Alanson Allen, Ira C. Allen, I. V. Baker, G. H. Cramer. The board elected W. W. Cooke, President; A. Allen, Vice-President; Ira C. Allen, Secretary and Treasurer. The road is leased to the Delaware & Hudson Canal Company.

Champlain Transportation Co.—At the annual meeting in

Burlington, Vt., Le Grand B. Cannon, of New York, was chosen President, and John B. Page, of Rutland, Vt., Vice-President.

Poughkeepsie Bridge.—At the annual meeting in Poughkeepsie, Jan. 12, the following directors were chosen: H. G. Eastman, George Innis, John F. Winslow, Poughkeepsie, N. Y.; Homer Ramsdell, Newburgh, N. Y.; F. M. Allyn, Hartford, Conn.; George F. Wilson, Providence, R. I.; J. H. Appleton, Springfield, Mass.; John G. Clark, Albert Thompson, Boston; A. B. Stone, Charles L. Perkins, E. L. Bowles, Wm. L. Thompson, New York.

Bridgeton & Port Norris.—At the annual meeting in Camden, N. J., recently, the following directors were chosen: Eben F. Westcott, Theophilus Trenchard, Thomas Hand, C. J. Lee, Joseph Parrish, B. F. Lee, C. W. Little, G. W. Jones, C. W. Case.

Western Railway Association.—At the annual meeting in Chicago, Jan. 9, the following directors were chosen: Robert Harris, Chicago, Burlington & Quincy; Thomas Allen, St. Louis, Iron Mountain & Southern; J. D. Cox, Wabash; Geo. H. Nettleton, Missouri River, Fort Scott & Gulf; J. C. McMullen, Chicago & Alton; Charles Paine, Lake Shore & Michigan Southern; B. F. Ayer, Illinois Central; T. F. Withrow, Chicago, Rock Island & Pacific; Burton C. Cook, Chicago & Northwestern. The board elected Robert Harris President; J. H. Raymond, Secretary and Treasurer; Robert Harris, T. F. Withrow, B. F. Ayer, Executive Committee; George Payson, Attorney.

Lehigh Coal Navigation.—The following companies, whose property is leased by this company and sub-leased to the New Jersey Central, held their annual meetings in Philadelphia, Jan. 8, with results as follows: *Treskow.*—President, E. W. Clark; directors, Geo. Whitney, J. M. Willcox, Fisher Hazard, Edward Lewis, E. Hill, C. F. Howell. *Nesquehoning Valley.*—President, J. B. Moorhead: directors, Geo. Whitney, Samuel Mason, Francis R. Cope, E. W. Clark, Charles Wheeler, Fisher Hazard, P. C. Garrett, A. J. Derbyshire, I. V. Williamson, Geo. F. Tyler, T. C. Henry, Henry Handy. *Lehigh & Lackawanna.*—President, Charles Brodhead; directors, A. Wolle, E. W. Clarke, John Leisenring, Francis R. Cope. *Lehigh & Luzerne Coal.*—Directors, John Leisenring, Francis P. Cope, Fisher Hazard, Charles Parrish, Francis C. Yarnall, Geo. Whitney, J. M Willcox, E. W. Clarke, Charles Wheeler, Alexander Biddle, T. Charlton Henry.

Philadelphia & Reading.—The following companies, whose lines are leased or controlled by the Reading, held their annual meetings in Philadelphia, Jan. 8, with the results given: *Allentown.*—President, G. A. Nicolls; directors, H. P. McKean, A. E. Borie, J. B. Lippincott, John Ashhurst, F. B. Gowen, Isaac Hinckley; Secretary, Howard Hancock; Treasurer, John Welsh. *Chester & Delaware River.*—President, G. A. Nicolls; Treasurer, John Welsh; Secretary, Howard Hancock; directors, H. P. McKean, A. E. Borie, J. B. Lippincott, John Ashhurst, F. B. Gowen, Isaac Hinckley. *Chester Valley.*—President, John F. Gilpin; directors, F. B. Gowen, Coffin Colket, H. P. McKean, A. E. Borie, J. B. Lippincott, John Ashhurst, William H. Holstein. *Chestnut Hill.*—Directors, Joseph Patterson, Wm. J. Schaffer, H. M. Phillips, F. B. Gowen, E. H. Weil, H. K. Smith, W. W. Colket, C. Colket, President, C. Colket; Secretary and Treasurer, Wm. W. Stephens. *East Mahanoy.*—President, G. A. Nicolls; Treasurer, John Welsh; Secretary, Howard Hancock; directors, H. P. McKean, A. E. Borie, J. B. Lippincott, John Ashhurst, F. B. Gowen, Isaac Hinckley. *East Pennsylvania.*—President, G. A. Nicolls; Secretary, Howard Hancock; Treasurer, John Welsh; directors, A. E. Borie, J. B. Lippincott, F. B. Gowen, Thomas Hart, Jr., Morton P. Henry, Isaac Hinckley, George D. Stitzel, Joseph L. Michener. *Mine Hill & Schuylkill Haven.*—President, Samuel Mason; managers, John Livezey, Alexander Derbyshire, Frederick Fraley, James H. Cresson, Charles H. Hutchinson, Samuel M. Bines, John W. Biddle, Benjamin H. Shoemaker, W. Hacker, Alfred Jones. *Reading & Columbia.*—President, G. A. Nicolls; Secretary, Howard Hancock; Treasurer, John Welsh; directors, H. P. McKean, A. E. Borie, J. B. Lippincott, John Ashhurst, Isaac Hinckley, Henry Lewis, F. B. Gowen, W. G. Case, George Boyle, Thomas Baumgardner, Frederick Lauer, Samuel Small.

Pennsylvania.—The following leased or controlled lines held their annual meetings in Philadelphia, Jan. 8, with the results given: *Western Pennsylvania.*—Strickland Kneass, President; directors, George B. Roberts, Edwin Smith, Josiah Bacon, Wistar Morris; Secretary and Treasurer, James R. McClure. *Southwest Pennsylvania.*—President, George B. Roberts; directors, D. R. Davidson, A. J. Derbyshire, J. N. Du Barry, John K. Ewing, Robert Hogsett, William J. Howard, Strickland Kneass, Israel Painter, B. F. Ruff, Thomas A. Scott, George A. Torrence, J. F. Wenthing. *Philadelphia & Merion.*—President, George B. Roberts; directors, Josiah Bacon, R. D. Barclay, A. J. Derbyshire, John P. Green, William J. Howard, Strickland Kneass, Joseph Lesley, Wistar Morris, Thomas A. Scott, N. P. Shortridge, Edmund Smith, William M. Spackman. *Philadelphia & Trenton.*—Directors, Strickland Kneass, N. Parker Shortridge, Josiah Bacon, Wistar Morris, A. J. Derbyshire, John M. Kennedy, Alexander Biddle, H. M. Phillips, Thomas A. Scott, George B. Roberts, G. M. Dorrance, J. N. DuBarry; Secretary, James R. McClure: Treasurer, W. Taylor. *Mifflin & Centre County.*—President, Strickland Kneass; directors, Josiah Bacon, Alexander Biddle, George W. Elder, John P. Green, William J. Howard, John M. Kennedy, Samuel Maclay, James H. Mann, Wistar Morris, George B. Roberts, Thomas A. Scott, Edmund Smith. *Columbia & Port Deposit.*—President, Strickland Kneass; directors, Thomas A. Scott, George B. Roberts, Edmund Smith, William J. Howard, Wistar Morris, Josiah Bacon, John M. Kennedy, N. Parker Shortridge, Alexander Biddle, Joseph Lesley, Jacob Tome, Morris Hoopes; Secretary and Treasurer, James R. McClure. *Bedford & Bridgeport.*—President, John Cessna; directors, John Alsip, George W. Anderson, Josiah Bacon, William Chenowith, J. N. DuBarry, John G. Hartley, William J. Howard, John M. Kennedy, John W. Lingenfelter, Wistar Morris, George B. Roberts, Edmund Smith.

Philadelphia & Reading.—The following circular from President Gowen bears date Jan. 10, 1877:

"The offices of First Vice-President, Second Vice-President and General Superintendent are hereby discontinued.

"Mr. John E. Wootten is appointed General Manager; his office will be at the general office of the company at Philadelphia; and all departments except those of the Treasurer, Secretary and Chief Engineer will report directly to him.

"The General Manager will appoint a Superintendent of Transportation, to have charge of all train service on the main line and branches.

"Mr. Thomas C. Zulick is appointed Superintendent of Canals. He will have charge of all the canals of the company, and will report to the General Manager.

"The rates of freight on the canals, upon all traffic other than coal, will be established from time to time by the General Freight Agent.

"The Chief Engineer will discontinue the office of Principal Assistant Engineer and the general roadway office at Pottstown, and divide the territory of the company into five residences, each under the charge of a resident engineer, who will report directly to the Chief Engineer, in Philadelphia.

"The transportation and roadway Paymasters' offices will be consolidated into one, and be annexed to the Treasurer's department."

East Broad Top.—At the annual meeting in Philadelphia, Jan. 8, Wm. A. Ingham was chosen President, with the following directors: Ario Pardee, Geo. B. Markle, Edward Roberts, Jr., Edward R. Wood, Percival Roberts, Charles Hacker, Franklin A. Comly.

Northeast Pennsylvania.—At the annual meeting in Philadelphia, Jan. 8, Franklin A. Comly was chosen President, with the following directors: John Jordan, Jr., J. Gillingham Fell, William C. Ludwig, Ellwood Shannon, Edward C. Knight Alfred Hunt, James H. Stevenson, Jacob Riegel, Richard J. Dobbins, G. J. Mitchell, Isaac Warner, Jr., George Fulmor. The road is worked by the North Pennsylvania.

St. Louis & Southeastern.—The office of General Superintendent has been abolished, and Gen. J. H. Wilson, Receiver and General Manager, will perform the duties of the office. Mr. O. M. Shepard, Assistant Superintendent, is appointed Assistant General Superintendent, with office at Evansville, Ind.

The following circular bears date Jan. 15, 1877:

"1. The office of General Road-Master is hereby abolished.

"2. Mr. J. C. Rawn, C. E., Division Road-Mast r, First Division, is hereby appointed Road-Master of the St. Louis Division, which consists of the line from East St. Louis to the water's edge at Evansville, also Shawneetown and O'Fallon branches.

"3. Mr. Franklin Sours, C. E., is hereby appointed Assistant Road-Master, St. Louis Division, and will report to J. C. Rawn, Division Road-Master, for duty.

"4. Mr. W. A. Hiester, C. E., Division Road-Master, Third Division, is hereby appointed Road-Master of the Nashville Division, which consists of the line from the water's edge at Henderson, to Edgefield Junction, also the yards at Edgefield and Nashville.

"5. Mr. J. H. Crowley is hereby appointed Assistant Road-Master, Nashville Division, and will report to W. A. Hiester, Division Road-Master, for duty.

"6. All reports and returns heretofore made to the General Road-Master will be made to the Road-Master of the respective divisions.

"7. Mr. W. S. Hotchkins, General Bridge Foreman, will report direct to the General Manager, but in cases of emergency will receive instructions from and work under the directions of the division road-masters."

Dayton & Southeastern.—At the annual meeting in Dayton, O., Jan. 10, the following directors were chosen: Daniel Kiefer, D. E. Mead, W. P. Callahan, W. H. Simms, Thomas A. Legler, Preserved Smith, Dayton, O.; M. C. Allison, A. J. Christopher, F. C. Trebein, Greene County, O.; S. N. Yeoman, John L. Persinger, Fayette County, O.; T. Woodrow, Jr., S. F. McCoy, Ross County, O.; H. F. Austin, D. C. Anderson, Jackson County, O. The board elected Daniel E. Mead President; Daniel Kiefer, Vice-President. The large majority of the board is from the Dayton end of the road, which, it is said, is not at all satisfactory to the stockholders on the eastern end of the line.

Erie Railway Conductors' Mutual Relief Association.—At the annual meeting in Hornellsville, N. Y., Jan. 9, the following officers were chosen: President, R. H. Stuart, Elmira, N. Y.; Vice-President, Chauncy Hall, Middletown, N. Y.; Secretary and Treasurer, Henry R. May, Corning, N. Y.; directors, Ralph Mead, W. B. Bassett, A. A. Pettingill, W. B. Van Warmer, H. B. Lupton.

Illinois & St. Louis.—At the annual meeting in Belleville, Ill., Jan. 11, the following directors were chosen: Adolphus Meier, R. Campbell, N. Schaeffer, J. W. Branch, R. Sellew, S. N. Holliday, James Clark, Russell Hinckley, G. A. Koerner, George Swigart, B. F. Switzer, J. B. Rentchler, Philip Schuck, Martin Herr, Jefferson Rainey. The board elected J. W. Branch President; N. Schaeffer, Vice-President.

North Carolina.—Col. T. M. Holt has been chosen President, in place of Maj. W. A. Smith, resigned. Col. Holt has been a director for nine years and was President for a year, several years ago.

Pittsburgh, Virginia & Charleston.—At the annual meeting in Pittsburgh, Jan. 8, the following were chosen: President, John Scott; Vice-President, B. F. Jones; directors, D. A. Stewart, W. J. Howard, Joseph Walton, H. B. Hays, M. B. Thompson, George V. Lawrence, Alexander Patton.

Sharon.—At the annual meeting in Meadville, Pa., Jan. 8, George Boyce was chosen President, with the following directors: E. A. Wheeler, P. L. Kimberly, Norman Hall, J. J. Pierce, J. F. Clark, F. Brown, Charles Latimer. The board elected John M. Murdock Treasurer, John H. Dynes, Secretary.

Missouri, Iowa & Nebraska.—At the annual meeting in Centerville, Ia., Jan. 1, the following directors were chosen: Henry Hill, Wm. Bradley, George S. Knox, James Fitz Henry, John E. Walker, J. A. Talbot, F. M. Drake, B. E. Smith, Andrew Carnegie, C. P. Palmer, George Opdyke, G. F. McCandless. Charles A. Secor. The board re-elected F. M. Drake President; Henry Hill, Vice-President and General Superintendent; James Fitz Henry, Secretary and Treasurer.

Peach Bottom.—At the annual meeting in Peach Bottom, Pa., Jan. 8, C. R. McConkey was chosen President, with the following directors: W. G. Ross, John Humphrey, A. G. Manifold, Wm. Wallace, W. Latimer Small, Michael Schall, S. Dickey, R. B. Patterson, J. P. Ambler, C. H. Stubbs, Isaac Bradley, John A. Alexander. Mr. S. G. Boyd, originator of the road and its President up to this year, was not re-elected, and Mr. Z. R. Laucks, Financial Agent, also failed of a re-election.

Mahoning & Pittsburgh.—At the annual meeting in Meadville, Pa., Jan. 8, A. S. Dickson was chosen President, with the following directors: L. C. Magan, J. H. Lenhart, J. E. McFarland, T. B. Lashells, M. P. Davis, A. L. Dunbar, John H. Wann. The board elected J. H. Devereux Treasurer; John H. Wann, Secretary.

Mercer Mining and Manufacturing Co.—At the annual meeting held in Meadville, Pa., Jan. 8, R. B. Roosevelt was chosen President, with the following directors: T. S. Wells, H. B. Wick, H. S. Huidekoper, James M. Breedin, S. Burke, David Derickson, Thomas H. Wells. The board elected John A. Dynes, Clerk; C. A. Derickson, Treasurer; F. H. Olyphant, Superintendent.

Shenango & Allegheny.—At the annual meeting in Meadville, Pa., Jan. 8, Mr. S. C. T. Dodd was re-elected President, with the following directors: Thomas H. Wells, R. B. Roosevelt, A. G. Egbert, David Derickson, S. Burke, H. B. Wick, H. S. Huidekoper. The board elected Thomas H. Wells, First Vice-President; R. B. Roosevelt, Second Vice-President; Charles A. Derickson, Treasurer; John H. Dynes, Secretary; James F. Blair, Superintendent.

Baltimore, Ohio & Chicago.—At the annual meeting at Chicago Junction, O., Jan. 9, the following directors were chosen: W. C. Quincy, Wm. Keyser, George B. Dennis, A. D. Smith, W. C. Holgate, David Lee, W. Cowen, S. I. Anthony. The board elected W. C. Quincy President; E. C. Winstanley, Secretary and Treasurer. The road is worked by the Baltimore & Ohio.

Norwich & Worcester.—At the annual meeting in Norwich, Conn., Jan. 10, the following directors were chosen: A. F. Smith, John F. Slater, Norwich, Conn.; F. H. Dewey, George W. Gill, Charles W. Smith, E. L. Davis, Worcester, Mass.; Wm. Weid, Boston; Robert Bayard, New York. The board elected A. F. Smith President; E. T. Clapp, Secretary; George L. Perkins, Treasurer.

Jacksonville, Pensacola & Mobile.—Gen. T. C. Spooner has been appointed State Agent in charge of this road, in place of Dennis Eagan, resigned. He has appointed Edgar Vliet General Freight and Ticket Agent, and F. B. Papy Treasurer.

Savannah, Skidaway & Seaboard.—Clavius Phillips and James W. Lathrop have been chosen directors in place of O. Cohen and J. W. Lathrop, deceased.

Boston, Revere Beach & Lynn.—The board has elected Edward Walden, of Lynn, Mass., President, in place of A. P. Blake, resigned. Mr. E. H. Whorf, late Assistant Superintendent, has been appointed Superintendent.

Hannibal & St. Joseph.—Mr. Wm. H. Neilson has been re-elected President. Mr. Wm. Bond, General Manager of the Missouri, Kansas & Texas, has been chosen a director in place of H. H. Baxter.

Mississippi Central.—Mr. R. P. Neely, who is now Receiver of this road (late a part of the New Orleans, St. Louis & Chicago), has made the following appointments: Treasurer, R. L. Walker; Auditor, R. S. Stedman; Acting General Freight Agent, C. H. Scurlock; General Ticket Agent, John H. Perry; Superintendent Mississippi Division, R. N. Colquhoun: Superintendent Tennessee & Kentucky Division, John G. Mann; Purchasing Agent, John C. Febiger; Car Agent and Superintendent of Telegraph, George M. Dugan. The general offices are at Bolivar, Tenn., those of the Tennessee & Kentucky Division at the same place, and those of the Mississippi Division at Water Valley, Miss.

Memphis & Little Rock.—The office of Auditor of Passenger Receipts for this road will be abolished on and after Feb. 1, 1877. All reports and communications heretofore addressed to that department will, in future, be addressed to M. S. Jay, General Passenger and Ticket Agent, Little Rock, Ark.

Lehigh Valley.—At the annual meeting in Philadelphia, Jan. 16, Hon. Asa Packer was re-elected President, with the following directors: Charles Hartshorne, Wm. W. Longstreth, J. Gillingham Fell, Wm. H. Gatzmer, David Thomas, Ashbel Welch, Wm. L. Conyngham, Ario Pardee, Wm. A. Ingham, Joseph Wharton, George B. Markle, Robert H. Sayre. There is no change from last year. The board re-elected John R. Fanshawe Secretary; Lloyd Chamberlin, Treasurer.

PERSONAL.

—It is stated that Mr. J. W. Jones, late First Vice-President of the Philadelphia & Reading Company, who is retired by the abolition of his office, is to be President of the Seyfert & McManus Manufacturing Company, of Reading, Pa.

—Col. Peter Donahue, President of the San Francisco & North Pacific Company, is making a trip east, traveling in his private car, which is provided with all the requisites for a long trip, including office, parlor, bed-room, etc. Col. Donahue is at present in New York, and his car is standing in the Pennsylvania depot at Jersey City.

—Mr. Kent Jarvis, of Massillon, Ohio, for many years a director of the Pittsburgh, Fort Wayne & Chicago Railway Company, died suddenly of paralysis of the heart, Jan. 15.

—Mr. H. A. Blood has resigned his position as Manager of the Boston, Clinton, Fitchburg & New Bedford Railroad, a disagreement with the board of directors being the reported cause.

—The New Hampshire Republicans have nominated as their candidate for Railroad Commissioner Dr. Granville P. Conn, of Concord. He began life as a civil engineer, but abandoned that profession and has been a physician for a number of years.

—Mr. A. P. Blake, President, and Mr. Henry Breed, Superintendent of the Boston, Revere Beach & Lynn road, have resigned their positions. Mr. Blake, who was the original projector of the road, intends to establish a winter resort for invalids, on a large scale, in the South.

—Mr. B. N. Farren, of Montague, Mass., well known as a large contractor, especially on the Hoosac Tunnel, was married last week to Miss Anderson, of Mount Holly, N. J.

—Major Wm. A. Smith, for several years President of the North Carolina Railroad Company, has resigned on account of ill health.

—Mr. Henry Lewis, who is this year the only new director of the Philadelphia & Reading Company, is a Philadelphia merchant of large wealth, and is also a director of the Central, of New Jersey, and the Delaware & Bound Brook companies.

—Mr. C. E. Benton, Master Mechanic of the Canada Southern Railway, died at his residence, St. Thomas, Ont., Jan. 8, of inflammation of the lungs.

—Mr. G. K. Jewett has resigned his position as President and a director of the Bangor & Piscataquis Railroad Company.

—Col. A. C. Dawes, General Passenger Agent of the Kansas City, St. Joseph & Council Bluffs Railroad, recently engaged in a friendly wrestle with a gentleman with whom he was talking in a store in St. Joseph, and was thrown and badly hurt, his spine being injured.

THE SCRAP HEAP.

Railroad Manufactures.

The Mason Machine Works have sold the double-truck narrow-gauge engine which was on the railroad in the Centennial grounds to the New York & Manhattan Beach Railroad Company, and have orders from the same company for four more of the same pattern.

The Vulcan Iron Works, of St. Louis, turned out last year 15,000 tons of iron rails and 10,000 tons of steel rails; the steel mill did not begin work until August.

Arms, Bell & Co., at Youngstown, O., manufacture bolts of all kinds, including railroad joint-bolts.

The Himrod Furnace Co., at Youngstown, O., last year turned out 21,000 tons of pig iron from two furnaces. One was recently blown out, but the other is still running on Bessemer iron.

During the year 1876 the Indianapolis Rolling Mill turned out 18,702 tons of iron rails, on orders for 17 different roads.

The Baldwin Locomotive Works recently delivered a new engine to the Union Railway & Transit Co., of St. Louis, for service on the bridge.

The National Locomotive Works of W. H. Baily & Co., at Connellsville, Pa., has a full force employed and a number of locomotives under construction.

The Joliet (Ill.) Iron & Steel Co. has large orders for steel rails on hand, and its rail mill is running full time.

The St. Louis Bolt & Iron Works are turning out a lot of street rails for a road at Fort Worth, Texas.

The Richards Furnace property, at Warren, O., was recently sold at Sheriff's sale for $4,700 in addition to a mortgage of $75,000

During the last year the Laclede Rolling Mill, at St. Louis, turned out 9,000 tons of street rails, bar and plate iron and rail fastenings.

The Niles Tool Works, at Hamilton, O., have orders for a number of car-wheel borers, lathes, planers and other tools.

Mr. M. J. Grove has been elected President, and L. K. Rishel, Secretary and Treasurer of the Co-operative Iron & Steel Works at Danville, Pa.

The National Tube Works Company is building 50 iron cars of the LaMothe pattern in its works at McKeesport, Pa.

The North Jersey Iron Company's furnace at Port Oram, N. J., will soon go into blast.

The Springfield shops of the Boston & Albany road have recently turned out three heavy passenger engines and have three more in progress. One of the first three has 6 ft. drivers, the rest 5 ft. 6 in.

The Manchester Locomotive Works, at Manchester, N. H., have lately delivered eight engines to the Quebec, Montreal, Ottawa & Occidental Railway; four to the Boston & Maine, and one each to the Kansas City, St. Joseph & Council Bluffs and the Missouri River, Fort Scott & Gulf.

RAILROAD GAZETTE

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CONDUCTED BY

S. WRIGHT DUNNING AND M. N. FORNEY.

CONTENTS:

	Page.
ILLUSTRATIONS:	
Consolidation Locomotive for the Pennsylvania Railroad —facing	29
Kentucky River Bridge	29
CONTRIBUTIONS:	
Brake Shoes — Their Influence upon the Life of Car Wheels	26
Examining the Ashtabula Bridge	26
Discussing Locomotive Accounts	26
Train Despatching	26
EDITORIALS:	
Railroad Construction in 1876	28
The Kentucky River Bridge	29
The Proposed Texas & Pacific Aid	29
Record of New Railroad Construction	30
EDITORIAL NOTES	30
GENERAL RAILROAD NEWS:	
Record of New Railroad Construction in the United States in 1876	23
Elections and Appointments	27
Personal	27
The Scrap Heap	27, 31
Transportation in Congress	30
Traffic and Earnings	31
Old and New Roads	31
ANNUAL REPORTS:	
Chesapeake & Ohio	33
Philadelphia, Wilmington & Baltimore	33
MISCELLANEOUS:	
The Ashtabula Accident	26
Master Mechanics' Association—Circulars of Inquiry	30
Trial of Atmospheric and Vacuum Brakes	33

Editorial Announcements.

Passes.—*All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.*

Addresses.—*Business letters should be addressed and drafts made payable to* THE RAILROAD GAZETTE. *Communications for the attention of the Editors should be addressed* EDITOR RAILROAD GAZETTE.

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

RAILROAD CONSTRUCTION IN 1876.

Our detailed record of the new railroads constructed in the United States in 1876, published this week, shows that during the year 105 railroad companies laid track on 2,442 miles of railroad, increasing the total length in the United States to 76,640 miles, which, according to the best estimates of the population at this time, gives one mile of railroad for every 600 inhabitants. We have now kept a careful record of the exact mileage laid within each calendar year for five years. The first of these years, 1872, was the culmination of the great era of railroad construction. During the five years preceding, according to Poor's Manual, 23,700 miles had been constructed in this country; for the six years ending with 1872 the average construction had been 5,170 per year, and in eight years the mileage of the country had been doubled. The progress since this culminating period will be seen by the following:

Year	1872.	1873.	1874.	1875.	1876.
Miles constructed	7,340	3,883	2,025	1,561	2,442

The greatest inactivity was but a little more than two years after the time of the greatest activity; for the great dulness did not extend throughout the year 1875. As we said in our review for that year, a larger proportion than usual of the mileage built in 1875 was constructed in the latter half of the year. We had news of but 22 per cent. of it at the middle of the year, and the greater activity in the last half indicated some slight revival in railroad construction. This was confirmed by the experience of this year, when, as we see, 888 miles, or 57 per cent., more was constructed than in 1875. This year, however, the proportion completed in the last half of the year has not been extraordinary—about 70 per cent. of the whole.

In one particular the work of 1876 was much like that of 1875; to a very great extent it consisted of the construction of local lines of no great length.

There was, however, a greater number of long lines built than in 1875, and the average mileage is greater than for two years previous, as is shown below:

Year.	No. of companies.	Total const'd.	Av'ge of each.
1872	210	7,340	35.0 miles.
1873	137	3,883	28.3 "
1874	105	2,025	19.3 "
1875	94	1,560	16.6 "
1876	105	2,443	23.3 "

Last year there were eight companies which constructed 50 miles or more each; in 1875 there were but six such companies. The eight companies with the largest mileage constructed but 498 miles of road in 1875; this year they constructed 898 miles. No company constructed as much as a hundred miles in 1875; five have done so in 1876, and one of them nearly 200 miles.

The summary below shows the mileage constructed during each of the past five years in each State and Territory, and the total mileage in each at the close of 1876. The basis of the total mileage is taken from Poor's Manual for the close of 1874, our records for 1875 and 1876 furnishing the additions:

Mileage of New Railroad Constructed in each State and Territory for Five Years.

	1872.	1873.	1874.	1875.	1876.	Total at end of 1876.
Alabama	134	2	18	0	0	1,722
Alaska	0	0	0	0	0	0
Arizona	0	0	0	0	0	0
Arkansas	156	247½	18	38½	49	787
California	195	85	140½	185	350¾	1,854
Colorado	105	121	23	111½	154½	950
Connecticut	25	29	0	21	7	925
Dakota	210	80½	0	0	0	290
Delaware	26½	21½	19	5	0	285
Florida	10½	0	18	0	0	484
Georgia	46	122	5	4	44	2,308
Idaho	0	0	0	0	0	0
Illinois	686½	274½	231	200	49	6,980
Indiana	183	84½	209½	109½	72¼	4,072
Indian Territory	142	0	0	0	2	281
Iowa	452	93	48	84½	86¾	3,937
Kansas	445	36	61	0	76	3,226
Kentucky	143	65¾	31¼	0	138	1,464
Louisiana	3	0	0	0	0	539
Maine	62½	0	37½	10	20	987
Maryland	194	34	12	17	15	1,092
Massachusetts	37	117½	27¾	36	5	1,825
Michigan	571	196	48	30	46	3,437
Minnesota	307	48	36	0	34	2,024
Mississippi	22	7	27	0	10	1,028
Missouri	314	236½	31	27	109½	3,016
Montana	0	0	0	0	0	0
Nebraska	212	31	0	22	53	1,181
Nevada	18	18	40	64	0	714
New Hampshire	43	60	45	15½	9¼	942
New Jersey	103	40½	39	72¼	84	1,594
New Mexico	0	0	0	0	0	0
New York	435	242¼	125¼	206	69¾	5,520
North Carolina	60	15	68	13	43	1,371
Ohio	456½	172	142½	26	270	4,680
Oregon	82	0	0	0	0	251
Pennsylvania	251	203	191½	136¾	90½	7,896
Rhode Island	0	22	14	0	9	182
South Carolina	88	88	0	15	17	1,352
Tennessee	15	114	0	0	7½	1,638
Texas	391	385½	75	34½	387¾	2,072
Utah	57	85	59	27	0	486
Vermont	31	53	5	32	0	810
Virginia	49½	36	70¾	0	10	1,648
Washington	40	50	6	0	0	110
West Virginia	76	36¼	0	0	0	576
Wisconsin	459½	320½	102	23	123¾	2,575
Wyoming	0	0	0	0	0	459
Totals	7,340	3,883	2,025	1,561	2,442	76,640

RECAPITULATION BY SECTIONS.

	1872.	1873.	1874.	1875.	1876.	Total at end of 1876.
New England (Me., N. H., Vt., Conn. & R. I.)	198½	281½	129¼	114½	50¼	5,673
Middle States (N. Y., N. J., Pa., Del. & Md.)	1,009½	541¼	386¾	437	259¼	14,411
South Atlantic (Va., N. C., S. C., Ga.)	243½	261	143¾	32	114	6,679
Gulf States (Fla., Ala., Miss., La., Tex.)	560½	394½	138	34½	397¾	5,845
South Interior (Ind. T., Ark., Tenn., Ky. & W. Va.)	535	463½	49¼	38½	196½	4,746
North Interior (O., Mich., Ind.)	1,210½	452½	400	166	388¼	12,203
Northwest (Ill., Wis., Minn., Iowa, Mo., Kan., Neb., Dak.)	3,086	1,130	509	356½	531	22,257
Far West Interior (From Northwest & Texas to Pacific States)	180	224	122	201½	154½	2,605
Pacific States	317	135	146½	180	350¾	2,220
Totals	7,340	3,883	2,025	1,561	2,442	76,640

The distribution of the construction of the last year is peculiar. Nearly one-half of the new road is in four of the 38 States. For some years Illinois led in the mileage constructed yearly, as it still does in total mileage. The seven States and one territory which we have included in the "Northwest" in 1872 embraced 42 per cent. of the new road of the year. In 1873 they had but 29 per cent., in 1874 25 per cent., in 1875 23 per cent., in 1876 less than 22 per cent. It no longer is the great field for railroad building. Illinois, which built 686 miles and 9½ per cent. of the whole in 1872, has but 49 miles and 2 per cent. of the whole in 1876. But Texas built very nearly as much last year as ever before, and a much larger proportion of the whole, taking the lead of the States with 388 miles and 16 per cent. of the whole. California follows with 350 miles and 14⅓ per cent. of the whole; then Ohio with 270 miles and 11 per cent. of the whole. The fourth place is taken by Colorado, the newest of all the States, with 155 miles of road and 6⅓ per cent. of the whole. The only other States which have more than 100 miles of new road are Kentucky, in which the city of Cincinnati has built 138 miles in a single line; Wisconsin, where the Potter law had reinforced more natural causes to prevent construction for two years previous, but which last year celebrated the repeal of the law by leading the Northwest in mileage constructed—124 miles; and Missouri, which has 109 miles.

The greatest length constructed by a single company is 196 miles by the Southern Pacific. Then follow: Cincinnati Southern, 138 miles; Texas & Pacific, 120; Columbus & Toledo, 117; Denver & Rio Grande, 108.

Ohio is the only one of the older States which shows a large mileage; there has been unusual activity there, and most of it in constructing local roads, many of 3-feet gauge. The roads there seem to be constructed almost wholly from home capital, and largely by those who expect to use them; and this may be said of most of the roads of 1876, even in the newer States. They have been built because their projectors expected profits from their earnings, and not, as very many were in 1873 and before, because the projectors expected profits from the work of constructing them.

There were eight State, and nine territories in which no railroad was built in 1876. Two miles were built in Indian Territory; all the rest in 30 States.

New England and the Middle States, which in 1875 seemed little affected by the dull times, and then constructed 35¼ per cent. of the total, last year were less active than for many years, and built but 12⅔ per cent. of the whole. The South, including all that territory south of the Potomac, the Ohio and the State of Missouri, made a great advance over 1875, constructing 712 miles against 105. More than one-half of this new construction was in Texas, but the increase is great over the construction of 1874 also, and with Texas excluded, and this notwithstanding the fact that in four Southern States no new railroad was built last year.

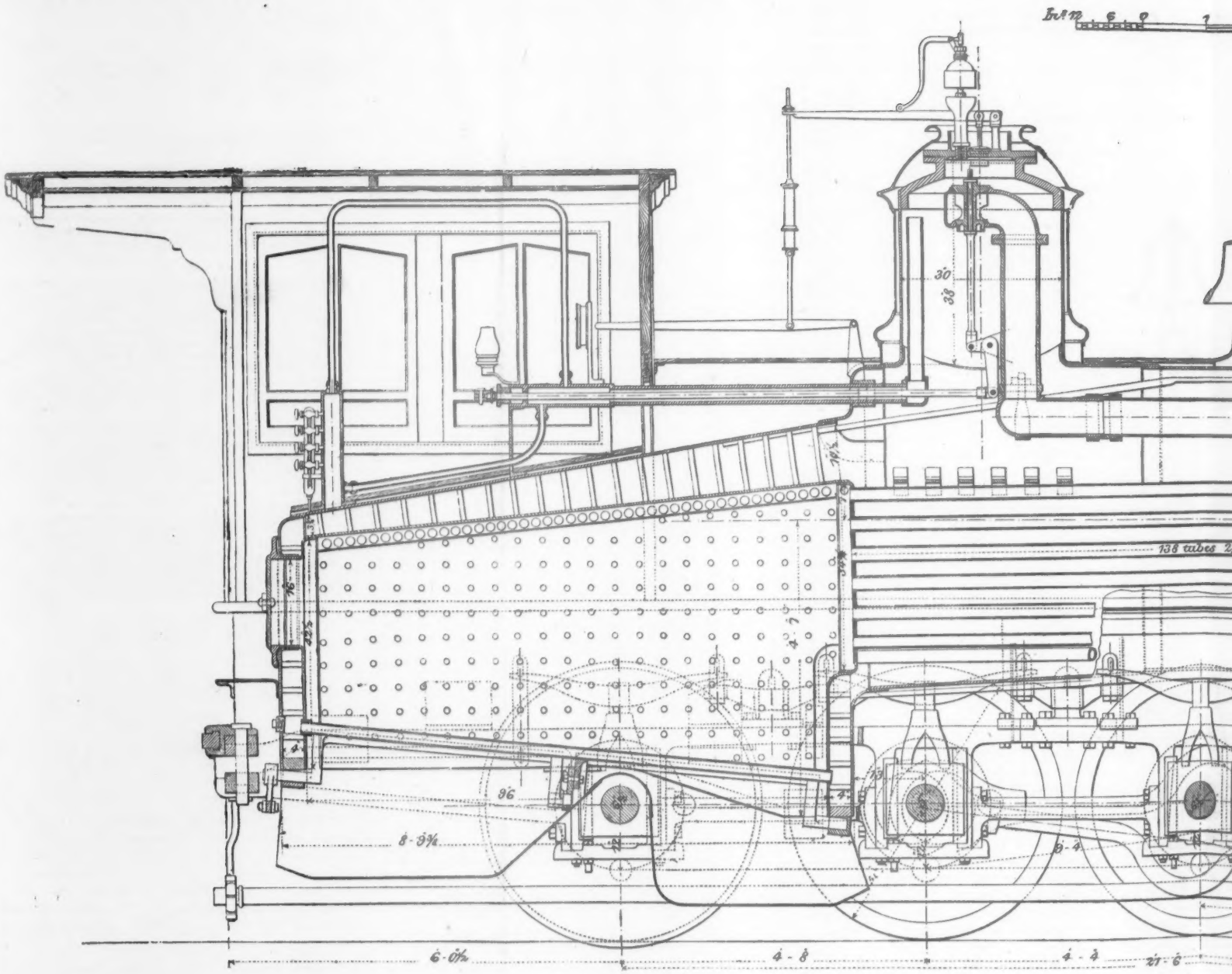
The year was favorable for railroad construction, except so far as regards obtaining capital. It was almost impossible to borrow money for new roads, and we do not remember that there was more than one instance of offering the bonds of a new road in the open market. But materials and wages were extremely cheap, and it was probably possible to build in many cases for one-third or two-fifths less than in 1872 and 1873. It is not probable that railroads can ever be built for less money than now, and it may pay to build lines now which were not worth building in 1873. There has been some anxiety shown to take advantage of the current low prices, and to this doubtless is due much of the work done last year. However, the difficulty of obtaining capital is often an insurmountable obstacle, and this difficulty extends to really promising projects. Still, the wonder is, not that the work was so small but that it was so great last year. The mileage of the country was increased 3.3 per cent., and at this rate we shall add nearly 30,000 miles to our railroad system within the next ten years. This is really very rapid work, and ought to be satisfactory in times so extremely dull, after such a deluge of disasters in railroad construction. Still there is a great field left for railroad construction in the country; and by this we do not mean that the great wilderness west of Minnesota and the Missouri will have to be gridironed like Illinois and Iowa in ten, twenty or fifty years; but that, aside from the lines in territory now wholly unprovided for, which will certainly be supplied as soon as such territory demonstrates that it will afford a paying traffic for such roads, there can probably be established a system of cheap, secondary railroads in the districts already well occupied, which will take the place of the country roads and serve as tributaries to existing lines. Much of the work of the past two years has been of this kind. Most of the very cheap roads now constructed are of narrow-gauge, which prevents their being as useful as they might be; but these were the only very cheap roads with which the public is familiar, and they may be immensely better than no railroad, and profitable where a heavy railroad of any gauge could not be supported. Our record notes a total length of 537 miles of narrow-gauge roads completed in 1876 (48 miles of 3 ft. 6 in. and the rest of 3 ft. gauge). This mileage is on 32 different roads and in 19 different States. There is now a considerable system of such roads is Colorado and Utah, and a considerable number of the roads (though generally not connected into a system) in Pennsylvania, Ohio and California. They are pretty sure to continue to increase unless other light and cheap railroads of standard gauge be introduced. The new lines likely to be most needed hereafter are railroads which will take a place between the public highway and those intended for fast trains and a heavy traffic. For such lines, usually not very long, there doubtless room now in many parts of the country. They will be mostly short, and probably (unless the existing railroad companies undertake them) projected, constructed and wholly or chiefly paid for by the communities which are to use them.

The chief lines now in progress which may construct a considerable mileage during the current year are the Cincinnati Southern, which will almost certainly complete its line to Chattanooga, across Kentucky and Tennessee; the Southern Pacific, which will probably reach the Colorado at an early day, and perhaps make a considerable advance into Arizona; and the Texas & Pacific, which will probably do something under any circumstances, and if it gets the Government aid which it asks will doubtless do a great deal. Money is cheap, materials are very cheap, and labor is cheap; and where reasonable evidence can be presented that a projected line will pay (not based on the assumption that the country on the line will doubtless double, treble or quadruple its production and shipments after the road is built), it is not likely to be very hard to get the road built. But capitalists were never more severe on this head: the days are past when they can build a railroad and sell its securities the same or the next year

FREIGHT LOCOMOTIVE ("CONSOLIDATION" TYPE) FOR THE P

Built by the Baldwin Locomoti

Fig. 1.



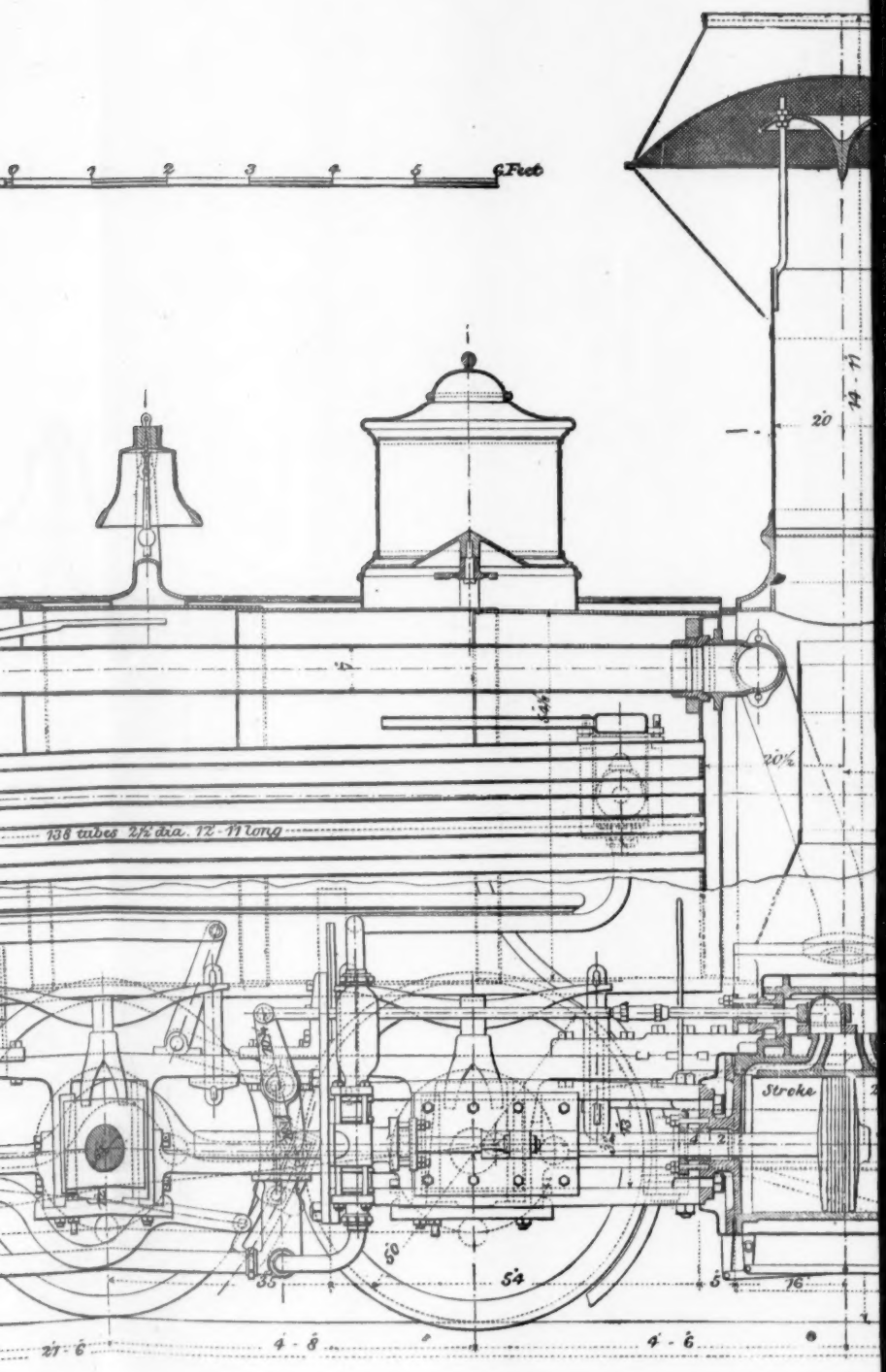
CYLINDERS:	FT.	IN.
Diameter,	1	8
Stroke of piston,	2	0
Length of steam ports,	1	5½
Width " "	0	1½
" of exhaust ports,	0	2½
Travel of valve,	0	5
Outside lap of valves,	0	0⅝
Inside " "	0	0 1/16

Exhaust nozzles—double, 3 in. × 3⅛ in. rectangular.

WHEELS:	FT.	IN.
Diameter of driving wheels,	4	2
" truck wheels,	2	4
Distance between centers of front and rear driving wheels,	13	8
Total wheel base of locomotive,	21	6
" " " and tender,	47	7
Diameter of driving axle journals,	0	6½
Length " "	0	7½
Diameter of main crank-pin bearing,	0	4½
Length " " "	0	5

THE PENNSYLVANIA RAILROAD AT THE CENTENNIAL EXHI

ldwin Locomotive Works, Philadelphia.

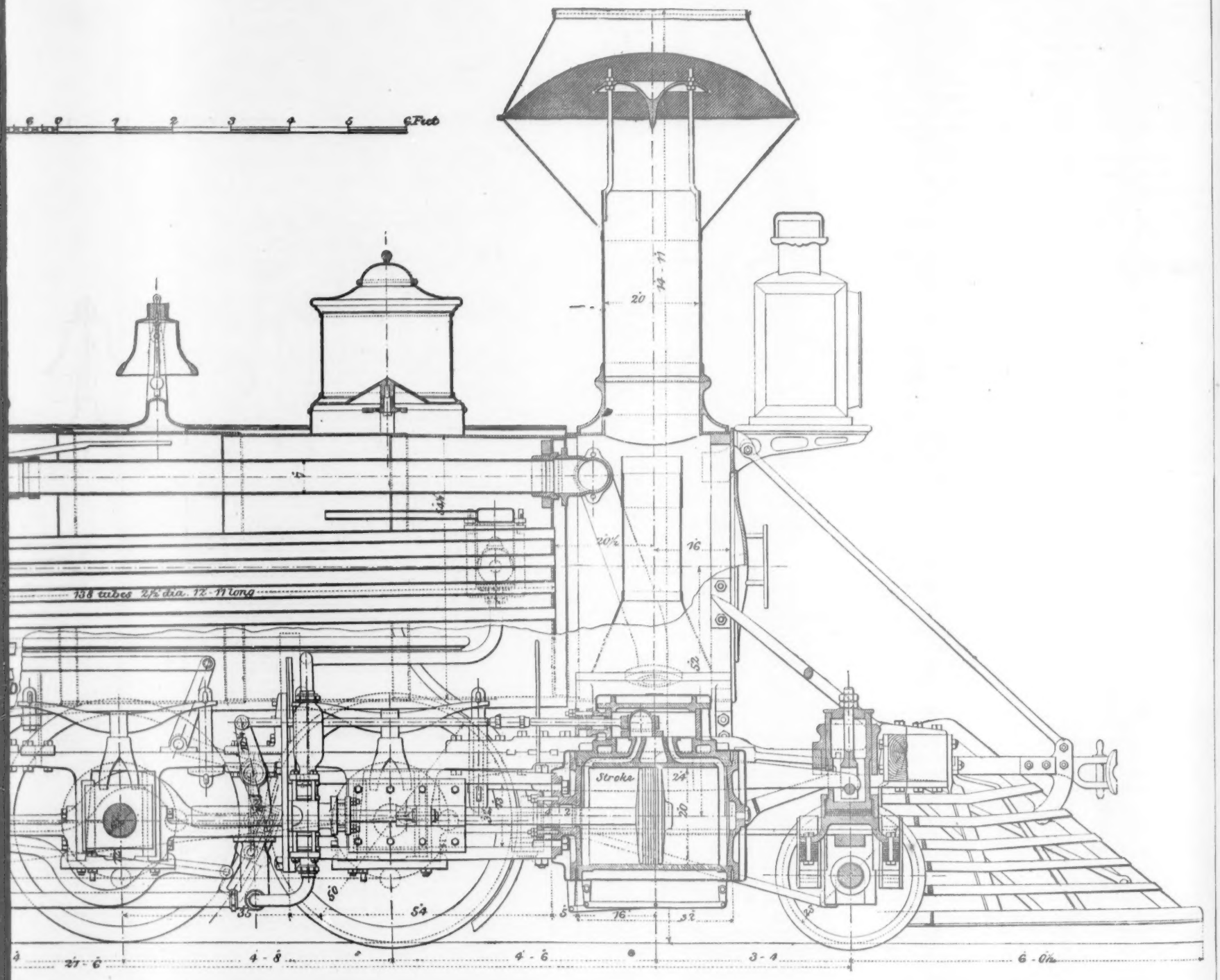


	In.
	2
	4
	8
	6
	7
	6½
	7½
	4½
	5

Boiler :	Ft.	In.
Outside diameter of smallest ring of boiler,	4	6⅛
Thickness of boiler plates (steel),	0	0⅜
Number of tubes (wrought iron),	138	
Length "	12	11
Outside diameter of tubes,	0	2¼
Thickness of tubes,	0	0.109
Length of firebox inside,	8	0
Width " "	2	10½
Depth " " (sloping),	42 in. to 61 in.	
Height of firebox crown above grate,	36 in. to 55 in.	

FOR THE PENNSYLVANIA RAILROAD AT THE CENTENNIAL EXHIBITION.

the Baldwin Locomotive Works, Philadelphia.



Ft.	In.
4	2
2	4
13	8
21	6
47	7
0	6½
0	7½
0	4½
0	5

Boiler:	Ft.	In.
Outside diameter of smallest ring of boiler,	4	6⅛
Thickness of boiler plates (steel),	0	0⅜
Number of tubes (wrought iron),	138	
Length "	12	11
Outside diameter of tubes,	0	2¼
Thickness of tubes,	0	0.109
Length of firebox inside,	8	0
Width " "	2	10½
Depth " " (sloping),	42 in. to 61 in.	
Height of firebox crown above grate,	36 in. to 55 in.	

Boiler—*continued:*	Ft.	In.
Thickness of tube plate (steel),	0	0½
" sides, back, and crown sheet (steel),	0	0 5/16
	sqr. ft.	
Grate surface,	23	
Heating surface in firebox,	92	
" " in tubes,	1166	
Total heating surface,	1258	
Flue area through tubes,	3.92	

Weight:	Lb.
Weight of engine in working order,	91,640
" " on coupled wheels,	79,400

at a profit. Now usually they have to hold them until the road has proved what it is worth.

THE KENTUCKY RIVER BRIDGE.

About twenty-three years ago, the late John A. Roebling commenced a work which, if completed, would have been the crowning triumph of his life. It was a railroad suspension bridge of 1,236 ft. span, crossing the canon of the Kentucky River 275 feet above the bottom of the gorge. The towers were built and the anchorages finished, but at this stage of the work the railroad company failed. Roebling was stopped, and until the engineers of the Cincinnati Southern Railway decided that no better crossing than at Roebling's location could be found, the giant piers stood in a deserted wilderness, a monument to the financial crash of 1857.

When Cincinnati decided to build a railroad to Chattanooga, the gorge of the Kentucky was found to be one of the worst obstacles on the route; and when bids on this crossing were called for, each competitor was required to make up his own plan for the entire structure, which plan it was obligatory should meet the difficulties attendant upon the following conditions of the case: First, the erection of a structure over a chasm 275 feet deep; next, in connection with this the fact that the rise and fall of the river was 55 feet and that it had been known to rise 40 feet in a single night and generally averaged a flood every two months. Lastly, the river makes a bend just under the bridge which renders its passage by steamers and rafts too hazardous to permit of the erection of a pier in the waterway.

A number of meritorious plans were presented, but the one finally accepted was that prepared by Mr. Shaler Smith, of the Baltimore Bridge Company. The viaduct as now being constructed consists of three spans of 375 feet each, resting on the bluffs and on two iron piers, which latter in turn are supported by stone piers, each 120 feet long by 42 feet in width at the base. The iron piers consist of four legs each, and while having a base of 71 ft. 6 in. by 28 ft., their longitudinal profile terminates in a point at the top, or rather in a 12-inch pin upon which the truss rests as on a rocker. The entire pier is a complete structure within itself and can be rolled about on the masonry, the pedestals resting on double roller beds for this purpose.

The truss itself is, during erection, a continuous girder of the Whipple type; but after erection it will be converted into one continuous girder 525 ft. long, projecting at each end 75 ft. over its points of support, and carrying from each of these cantilevers a 300-feet span, which bridges the distance from the end of the cantilever to the bluff. It was necessary to make the bridge a continuous girder in order to raise it without false-work; and the hinges were obligatory because the rise and fall of the piers from thermal changes will amount to fully two inches, and would vary the strains hourly in a true continuous truss. The truss is 37.5 ft. deep and 18 ft. wide, and each bay is divided into 20 panels of 18.75 feet each. All connections between ties, posts and chords are hinged on pin connections, but the chords are riveted to each other throughout, with the novel addition that the pin carrying the tie bars is forced into the chord splice by hydraulic pressure, and thus does duty as a rivet. It will be seen that the details combine both the American principles of pin joints and of massing the materials in approved shapes along the lines of strain, together with the European practice of continuous riveted chords fitted to resist both tension and compression. This peculiar mode of construction was adopted in order to erect the truss in the manner which we are now about to describe.

After the bridge seat was cut out of the cliff, the end posts were set up and the first section of bottom chord laid in place, each chord being continued back to the rock by a large screw-jack placed between its rear end and the face of the bluff. Then the top of each end post was bolted back to Roebling's towers by anchor bolts, which had a screw adjustment. From this point the end or main tie was carried to the bottom chord at the foot of the second post, and then post No. 2 and the first panel of top chord were put in place. When the first panel was in position the work looked as shown in fig. 1. It will readily be seen that with these connections once made the structure could be built out panel by panel until the limit of strength of the anchorage bolts or of the top chord or the available resistance of the Roebling towers had been reached. This last was the governing factor, and the other parts were proportioned to suit. Accordingly, as the truss grew out from the face of the bluff a temporary wooden tower sprang up from the bottom of the valley to meet it, the centre of the tower being 196 ft. 10 in. from the shore end of the span. When the truss was landed on the tower, the four truss posts resting on it were raised by large jack-screws until the anchor bolts were relieved of a previously determined portion of their strain, and when this point was reached the work of carrying out the span was again commenced.

The next flight was to the permanent pier, 178 ft. 2 in. When the span left the bluff the iron pier was started upward from the masonry, and the two met in mid-air, the working forces on each arriving at the point of junction within two hours of each other. The weather was cold, and the span was short, owing to the compression of the lower chord and the effect of temperature; but this had been foreseen, and the huge pier, weighing 400,000 lbs, was moved on its rollers towards the span until the pier

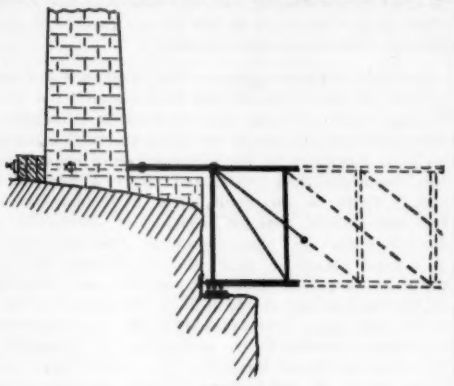


Fig. 1.

which connects the two could be put in place. This done, the truss was built out as before until the middle of the river was reached, which completed the work from the north side. In the meantime the temporary wooden tower had been taken down, and at this present writing the same process just described is going on, but from the south side of the river.

When the two halves of the bridge meet, in the centre of the middle span, the two projecting half-spans will be adjusted to the same level by loading the shore spans, and the connecting sections of chord put in place. The last operation will consist in taking out the bottom chord pins in the fourth panel north and south of each pier in the shore spans, thus hinging these two spans and fixing arbitrarily and without ambiguity the strains in all parts of the truss. In order that there may be no doubtful action at the hinging points, both web systems are concentrated into one in the two panels adjoining the post at which the chord is cut, as shown in fig. 2.

This is also done in the end pan ls of each span in order to concentrate the shearing strains more conveniently.

In erecting this bridge the most important points for computation were: first, the angle to be given the span at starting so as to land properly on the wooden pier, and, next, the correct elevation to be given to the truss at the wooden tower so that an exact junction could be made with the pin on the top of the permanent iron pier. These operations were both successful.

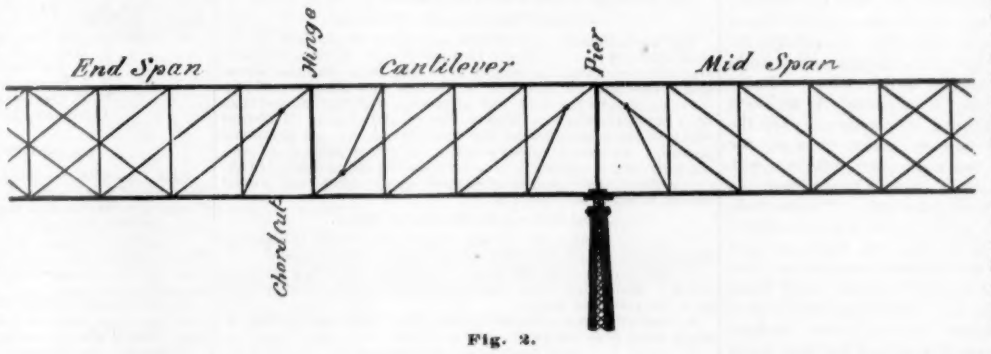


Fig. 2.

Altogether, in the novelties introduced in both construction and erection, and in strict adherence to theory throughout, this great viaduct—the most important in the world in regard to length of span in connection with its height—is probably unsurpassed by any similar work now existing. When it is completed, we hope to publish a plate and full description.

The engineers who decided upon Mr. Shaler Smith's design as the best were Mr. Thomas D. Lovett, then Consulting Engineer of the Cincinnati Southern, and Mr. G. Bouscaren, who has since succeeded him in that position. The iron work was all done by the Edgemoor Iron Company, and it was watched and inspected from the rolling mill pile to the finished bridge, pieces being tested out of every plate used. The modulus of elasticity was obtained for every individual eye-bar, and the bars were paired together according to their moduli. Messrs. C. C. Wrenshall, Charles Houser and Michael Walsh are the superintendents in charge of the erection, and the engineers on the part of the railroad company are Messrs. Rudolph Weiser, Charles Lasker and Charles Bates. The erection was begun Oct. 16 and will probably be completed about Feb. 20. There are 2,855,000 lbs. of iron in the spans, and 798,000 lbs. in the piers, and the amount of masonry is 12,915 cubic yards. The spans have iron stringers as well as floor beams.

Conundrums.

A correspondent writes: "Why does reversing a locomotive when under headway cause the tubes to leak?' In reply reference may be made to the well-known discussion by the wise men, a long time ago, who attempted to show why a pail of water with a live fish in it does not weigh any more than it does without a finny occupant. A fool, tradition says, who took no part in the deliberations of the philosophers, instead of talking about it, took a pail of water and weighed it with and without a fish, and found that the difference in weight was precisely that of the weight of the fish. Now, we propose to assume the same attitude as the fool did in discussing the question proposed by our correspondent, and to doubt the fact that "reversing a locomotive when under headway" does "cause the tubes to leak." At least we will doubt it until our correspondent or some one else gives some sufficient evidence for believing it.

The same correspondent also asks: "Why does reversing a locomotive when under headway 'knock down' the packing of piston?" There is no reason apparent to us for this—if it is a fact—unless it be that the action of the piston, which produces a vacuum at one end of the cylinder, exhausts the air from the inside of the piston, and the pressure in the opposite end of the cylinder acts against the outside of the packing rings to compress them. Is it certain, however, that this effect always follows the alleged cause? Will some practical locomotive runners answer?

Another inquirer asks whether "axles with bearings inside the wheels have been tried on cars or coaches in this country? Are there more serious objections to their use than that of being less convenient for inspection or repair? If there are not, do you consider that this more than offsets their greater strength for a given weight? Do you think there need be any material difference in the steadiness of car bodies carried on inside trucks?"

Axles with inside bearings were at one time extensively employed on the Erie (six-feet gauge) road. Besides the objection of being less convenient for inspection and repair, which is very serious, there is also the difficulty of confining the oil inside the box, because an inside bearing must be open at each end, whereas bearings outside the wheels can be closed up tight on the outer end, and can also be kept at least approximately tight, by means of a dust-guard made of leather or other material on the inside. The latter is much more difficult with inside bearings. Then, too, if our correspondent has ever observed, the weakest part of an axle is just inside of the hub of the wheel. It is at this point that by far the largest number of breakages occur. If now the journal is placed at that locality, its wear would constantly diminish the size of the axle at that point, and thus weaken it. In case of the journal becoming hot the axle would, of course, be weakened by the heat, which is much more dangerous if it occurs at the point of greatest strain to the axle than it would be on a journal outside of the wheels. For this reason, therefore, inside bearings instead of being stronger are in reality weaker than those outside of the wheels. There would not, we think, be any material difference in the steadiness of the cars, but probably somewhat stiffer springs would be needed because the lateral motion would exert a greater leverage on the springs if they were inside the wheels and consequently nearer together than it would if they were outside and therefore further apart.

The case of locomotive driving and truck-wheels might be quoted as examples of the successful operation of inside bearings. They are used, however, only because it is impracticable to have them outside. It must be remembered too that these receive and require much greater care than car journals do. A locomotive is under the charge of an experienced and skillful man, and all the bearings are carefully inspected and oiled at comparatively short intervals of time; whereas cars are now compelled to travel to and fro in the world without any of the tender care which is bestowed upon locomotives.

Consolidation Locomotive at the Centennial Exhibition.

We give this week a double-page engraving from *Engineering* of a locomotive constructed at the Baldwin Locomotive Works for the Pennsylvania Railroad Company, and which was exhibited at the Centennial. Next week we will publish some other views and a full description of it, for which there was not room in this number.

The Proposed Texas & Pacific Aid.

The Texas & Pacific scheme, as it is now described, provides that the Southern Pacific construct the line from the west to a point 100 miles west of El Paso, and receive the same aid as the Texas & Pacific for that part of the line east of Fort Yuma, and for a connection with San Diego; while the Texas & Pacific will build the eastern section of the road. But the most remarkable part of the scheme is its provision for four branches, aggregating an enormous length, all of them situated where it has been impossible to get anyone to build a railroad hereto-

fore, and most of which could not possibly pay anything like the interest on their cost, but which would materially divert traffic from some existing lines which hardly have enough to support them now. One of these is an extension of the Atlantic & Pacific through the entire length of the Indian Territory, where settlements are prohibited by law; this would get scarcely any traffic except the through traffic to and from St. Louis, and all of this would be taken from the Missouri, Kansas & Texas and the St. Louis, Iron Mountain & Southern, which certainly need all they are likely to get. A second is a line from Jefferson to Memphis, which would get some local traffic, but not enough to support it if the experience of other Arkansas railroads is any guide, and would take traffic from the present short route by the Iron Mountain and Memphis & Little Rock roads; a third is a comparatively short line, from Shreveport to Monroe, completing the line due east to Vicksburg; which will doubtless be worth building when the Texas & Pacific is done, and is almost sure to be built when that event occurs, with or without Government aid. The fourth is a line diagonally across Louisiana from Shreveport to New Orleans, which would serve as the New Orleans connection of the road, and would be more reasonable if New Orleans could not get a Texas & Pacific connection by a line one-third as long (extending Morgan's road to the Sabine), which, moreover, would be of more value to New Orleans as a general Texas connection than almost any other railroad could be; and if the line to Vicksburg would not give New Orleans another reasonably direct connection.

There are some railroads in the South which will be benefited somewhat by the completion of the Texas & Pacific main line: but the construction of these branches would be a direct blow to several important existing lines, and they certainly have a right to protest against the destruction of their property by Government act. The plan is very like that adopted when the Union and Central Pacific were subsidized. The Sioux City & Pacific, the Central Branch Union Pacific, the Kansas Pacific and the Southern Branch Union Pacific (now the Neosho Division of the Missouri, Kansas & Texas) were subsidized as branches of the main line. Not one of these roads serves as such a branch, and only one of them pays the interest on its own bonds; though when built they interfered with no previously existing roads. Whatever may be thought of the general policy of a subsidy, it will be a great injustice if roads are built by such aid which, almost certainly unprofitable in themselves, will take away the business of roads already built by private capital and now insufficiently supported.

Record of New Railroad Construction.

The lines not previously chronicled which enter into our complete record for the year 1876, published in this number, are 2½ miles of the *Delaware, Lackawanna & Western*, from Hoboken, N. J., through the new Bergen tunnel; 18 miles on the *Dayton & Southeastern*, between Dayton and Xenia, O.; 17 miles on the *Ohio Central*, from Pleasantville, O., north to the Pittsburgh, Cincinnati & St. Louis 4⅕ miles east of Newark; 7 miles of the *Northern of California*, from Williams, Cal., northward; and 50 miles of the *Southern Pacific*, from Goshen, Cal., westward. This is a total of 92 miles of new railroad.

THE ADVANCE OF RATES which went into effect last Monday, curiously enough is not general: the Lake Shore and Michigan Southern maintains the old rate of 35 cents per hundred for grain and 40 cents for fourth class from Chicago to New York, all the other lines charging five cents more. Under ordinary circumstances it would of course be impossible to maintain such a difference; but under existing circumstances, when the snow blocks the roads so that they are unable to supply the demands upon them, it may not make much difference with the traffic of the roads. All seem likely to have all they can carry at present (and that is not a great deal). It is not probable that a great deal of grain will come forward at 40 cents a hundred; but at this season there is a very large provision movement, which is active at 45 cents, and perhaps would bear even a higher rate. With the terrible weather, which limits traffic and increases expenses, the railroads are not likely to make large profits at the highest rates proposed. We have seen no reason stated for the unwillingness of the Lake Shore to consent to the advance. The arrangement of the trunk lines provides that the east-bound rates shall be fixed by agreement of the lines which first receive the freight, but they need not agree if they do not choose to. The higher rate will not be likely to last longer than March, as some time before navigation opens a reduction is usually made to prevent the holding of freight, and grain especially, for the vessels.

AMERICAN PIG IRON PRODUCTION, according to careful estimates made from data collected by Mr. James M. Swank, Secretary of the American Iron and Steel Association, was 2,050,000 tons of 2,000 lbs. in 1876, against 2,266,581 tons in 1875, by the final returns to the Association, the decrease thus being 9.8 per cent. But as the stock on hand was reduced during the year from 760,908 to 660,000 tons, the decrease in consumption would appear to be only 116,000 tons, or about 6 per cent. The report of production by States shows a decrease of 37½ per cent. in New England and New York, an *increase* of nearly 3 per cent. in Pennsylvania, a decrease of 9 per cent. in Ohio, and a decrease of 12 per cent. in the States west of Ohio. The largest producers in 1876 were: Pennsylvania, 48¼ per cent.; Ohio, 18⅝; New York, 8⅞; Michigan, 4; Missouri, 3⅛; Illinois and Wisconsin, 2¼ per cent. each. This accounts for 88 per cent. of the whole. The anthracite districts of Pennsylvania increased their production from 555,000 to 567,000 tons; the bituminous districts of the same State from 405,000 to 422,000 tons. In Ohio there was a decrease of 20 per cent. in the production of the Hanging Rock region and an increase of 16 per cent. in that of the Mahoning valley; while in miscellaneous there was a decrease of 15⅓ per cent.

NATIONAL LEGISLATION is recommended by Mr. Charles Francis Adams, Jr., in an open letter to Mr. James A. Garfield, Member of Congress from the Ashtabula district, to secure thorough and impartial investigation of such disasters as the late accident at Ashtabula. He refers to the similar work done by the Massachusetts Railroad Commission, but says that the duty is one properly incumbent on the nation. He would have simply a provision for a bureau of the Interior Department with two officers, one an accountant and statistician and the other a railroad expert and engineer. The latter should personally investigate the railroad accidents presenting unusual features or of obscure origin and report upon them. This is substantially the English system. The inspectors state the causes, so far as ascertainable, and endeavor to show how each accident might be avoided, and are free to call attention to any lack of material or apparatus, or neglect to adopt improvements; and this doubtless has a powerful effect, though the inspector has not one particle of power to interfere with any company's practice.

RAILROAD COMMISSIONERS FOR NEW YORK are provided for in a bill introduced into the New York Assembly last Tuesday. They are to have, so far as appears from the bill, almost precisely the same functions as the Massachusetts Commissioners, are to be appointed by the Governor, serve respectively for two, three and four years, and receive a salary of $7,500 each. There is no doubt that a Commission might be very useful, but of course its usefulness would depend upon the men chosen as Commissioners, and if a good salary is paid the politicians will claim the places as part of their spoil, and will make it very hard to fill the places as they should be filled. However, that is true of all offices, and is more a reason for not expecting too much of a Commission than for not having one. A Commission with functions like that of Massachusetts is effective just about in proportion to its ability; but is not able to do much harm if incapable, which is one of its good features.

Transportation in Congress.

In the House on the 10th:

A bill to repeal so much of the act of Dec. 17, 1872, as provides for a pivot draw in any bridge to be erected across the Ohio River between Covington and Cincinnati was discussed and rejected by a vote of 74 to 133.

In the Senate on the 12th:

Mr. Gordon, of Georgia, introduced a bill to create a sinking fund for the liquidation of the Government bonds advanced to the Pacific railroad companies (Union, Central and Western). Referred to the Committee on Railroads.

Mr. Chaffee, of Colorado, introduced a bill to abolish the use of stoves for heating railroad passenger cars. Referred to the Committee on Railroads.

In the Senate on the 15th:

The chair presented a communication from the Secretary of War inclosing the final report of Major W. B. Craighill, Corps of Engineers, upon the survey for a line of water communication from the Ohio or Great Kanawha River to tide-water in Virginia. Referred to the Committee on Transportation Routes.

Mr. Cameron, of Pennsylvania, presented the resolutions of the Pittsburgh Chamber of Commerce asking an appropriation for the construction of a trans-Alleghany line of water transportation from the Atlantic to the West via the Youghiogheny route. Referred to the Committee on Transportation Routes.

Master Mechanics' Association—Circulars of Inquiry.

The following circulars have been issued:

LOCOMOTIVE BOILERS AND FIRE-BOXES.

The undersigned, a committee appointed at the last annual convention of the American Railway Master Mechanics' Association to report on the subject of "The Best Material, Form and Proportion for Locomotive Boilers and Fire-Boxes" beg leave to present the following questions, with the request that each Superintendent of Motive Power and Master Mechanic will give the Committee all the information he can in answer thereto. *We would remind you that the co-operation of all parties interested is necessary in order to enable the committee to obtain sufficient data upon which to make a report that may present new or valuable information.*

Best Material for the Shell of Boiler.

1. In your opinion, all things considered, which is the best material for the shell of locomotive boilers, iron or steel?

2. Have you ever known steel sheets in the shell of a boiler to crack? If so, what were the circumstances, and your opinion as to the probable cause?

3. Under the same circumstances which is the most liable to waste away from corrosion, iron or steel?

Best Material for Fire-Boxes.

4. Which kind of fuel is in general use on your road, anthracite or bituminous coal?

5. With the above fuel, have you found steel to be the best material for fire-box sheets? If not, what do you think is better?

6. Is a very soft, pliable quality of steel more durable in service, and less liable to crack than a quality that is medium?

7. How many steel fire-box sheets on your line have cracked during the year 1876? How many iron?

8. In which sheets, and in what part of the sheet, did the crack occur? Direction of fracture? Length? Kind of steel or iron?

9. Under what circumstances, in each case, did these cracks occur, and what was the thickness of the sheets?

10. What per cent. of the whole number of each kind of fire-boxes on your road cracked?

11. What mileage did each make before cracking?

12. What is the best material for stay-bolts, soft steel or good iron?

13. Do you think it advisable to make all stay-bolts with a small hole through the center, so that leakage would at once indicate a broken bolt?

14. Would galvanizing the water side of fire-box sheets and tubes prevent, to any considerable extent, the adhesion of scale?

Form of the Shell of the Boiler.

15. What is the best form of boiler for the eight-wheel American style of locomotive, taking into account steam room, and disposition of weight on the driving-wheels, the "wagon-top" or "straight" boiler? What is the best form for the Mogul pattern of engine? And what for four and six-wheel switching engines?

16. Do you consider one steam dome sufficient in all cases, or are two preferable on large boilers?

Form of the Fire-Box.

17. Is the rectangular form of fire-box the best that can be adapted to the present style of locomotive, as regards economy of fuel and durability? If not, what form is better?

18. Is the use of a water-table in the fire-box economical (fuel and repairs of fire-box considered)? If so, to what extent?

19. Has the use of a brick arch in the fire-box proved to be economical? If so, to what extent?

20. As regards fuel and maintenance of fire-box, how does the so-called Weston boiler compare in economy with the ordinary plain fire-box of the same heating surface?

21. Have crown sheets corrugated to such an extent as to dispense with the use of crown bars proved more satisfactory in results than the sheet supported by crown bars? How does the cost of construction of the former method compare with that of the latter?

22. Have any corrugated steel side sheets cracked in the manner common to plain sheets? If so, what was the direction of the crack? How long had such sheets been in use? Were stay-bolts situated in the bottom and top of the corrugations, or otherwise?

23. Have any small cracks manifested themselves at stay-bolts, in corrugated side sheets? If so, what was their direction compared with that of the corrugation?

24. From experience and observation, is it your opinion that channels, say three-eighths of an inch deep, and extending vertically two feet or more above the grate, between alternate, or each third or fourth row of stay-bolts of the side and end sheets of the fire-box, will effectually overcome the tendency of such sheets to rupture?

25. Is it necessary to have any channels or corrugations in a horizontal direction? If so, why?

26. Should the course of the channel be towards the fire, and free from any stay-bolts, or otherwise?

Proportions.

27. Do you recommend any change in the proportions of boilers now in general use that will result in economy of fuel? If so, in what particular?

28. Will a boiler with a fire-box, say seven feet long, and tubes ten feet long, give better results as regards economy of fuel, where bituminous coal is used, than one with a fire-box 5¾ feet long, and tubes 11¼ feet, other things aside from heating surface being equal?

29. Will the heating surface of a fire-box five feet deep give better results in the use of bituminous coal than one four feet deep, heating surface being the same in both?

30. Is the value of the heating surface of the crown sheet in proportion to its nearness to the fuel in combustion?

31. Would an increase of waterspace to the extent of 50 per cent. over that in practice, at points where the heat is greatest in the lower part of the fire-box without much if any increase at the top, result in economy of fuel, or otherwise?

32. In your opinion, what are the best proportions for a fire-box of a locomotive, having 16 by 24-inch cylinders, and five-feet drivers, to burn bituminous coal? The most economical length of fire-box? Height above grate? Waterspace at grate? At top? What depth of water on crown sheet, to give best results? Length of tubes? Diameter outside?

33. Does the comparatively rapid deterioration of the part of the sheets nearest the fire on the grate prove the heat to be greatest there? If so, should not the waterspaces be greater at such point?

34. What size waterspaces around the fire-box have given the best results as to economy of fuel on your road?

35. What size have proved to be least economical?

Means for Promoting a More Perfect Combustion.

36. Is it beneficial to admit air to the fire-box above the grate? If so, at what height? At what points? How many inches of area of opening, per square foot of grate, has given the best results, as regards economy of fuel, bituminous coal being used?

37. What thickness of bar of the grate and what space between the bars give the best results, with the coal used in engines on your line? Thickness of bar? Space between bars?

38. Is it beneficial to use a "dead plate" across the front of the fire-box? If so, what per cent. of the length of fire-box?

Please insert the answers to the questions in the spaces left for that purpose, if room enough, otherwise, on separate sheet, and return all to the Chairman of the Committee, R. WELLS, Master Mechanic Jeffersonville, Madison & Indianapolis Railroad, Jeffersonville, Indiana, previous to March 15, 1877.

R. WELLS, M. M., J. M. & I. R. R.,
C. R. PEDDLE, Sup't Machinery, T. H. & I. R. R.,
S. J. HAYES, Sup't Motive Power, I. C. R. R.,
N. E. CHAPMAN, M. M., C. & P. R. R.,
J. JOHANN, M. M., T., W. & W. R. R.,
Committee.

LOCOMOTIVE FRAMES AND BRACINGS.

The Committee appointed by the American Railway Master Mechanics' Association, to report on the best "construction of locomotive frames and bracings," present the following questions, and request an early reply thereto:

What kind of frames have the locomotives under your charge? Have you had any experience with slab frames? And if so, what are the relative merits of same as compared with square or skeleton frames?

If your experience has shown any advantages in slab frames over square or skeleton frames, what have you found to be the best form of their construction?

What do you consider the best form of square frames? Should it be welded up solid, or should the rails, pedestals and brackets, or any part of them, be made separate and bolted together?

Do you prefer wood or iron front bumpers? Please state reasons for the form of construction preferred.

What do you consider the proper width and depth of the front and back rail of a passenger locomotive, 16 × 24 cylinders? What do you consider the proper width and depth of the front and back rail of a freight locomotive, 18 × 24 cylinders, six drivers?

What length and width of pedestals would you recommend to give the best result with driving boxes? Driving shaft to be 7 in. diameter, how should the pedestal caps be secured to the bottom of the pedestals?

How many wedges do you put to each pedestal? If two, what are their advantages over one?

What is the best form and method of bracing the frames at the cylinders?

Do you consider bolts through the frames and cylinders sufficient fastenings, or should there be the additional security of lugs forged on the frames?

What do you consider the best position for the braces between pedestals? Should they be in line with the journals, or at the bottom of pedestals? Should they be welded in, or secured by bolts to the pedestals?

What do you consider the best form and method of bracing the frames at waist of boiler? Give a description of number and form of braces, how fastened to boiler, and what provision (if any) is made for expansion? What at the fire-box? If in slides, what form of slides? What at the foot plates? Should there be angle braces to the smoke box, and back of boiler head, and if so, how should they be secured?

What is your opinion of cross bracing, and what is the best method?

How many frames have you had broken? What class of frames were they, and to what do you attribute the failure?

Have you a standard frame and bracings on the locomotives under your charge? If so, please send the committee drawings

or tracings of the same. Please explain why you adopted the frames as a standard?

The above questions relate to the two forms of frames (slab and square) ordinarily used. Have you had any experience with any other form of frames? If so, please describe it.

Any additional data or opinion bearing on this question will be thankfully received, also drawings or tracings showing construction of frames and braces now in use or recommended.

Please reply before March 1, 1877.

J. M. BOON, P., F. W. & C. R. R.
J. M. WILDER, Erie R. R.
E. H. WILLIAMS, Baldwin Locomotive Works.
A. MITCHELL, L. V. R. R.

Please address your replies to

JAS. M. BOON,
Master Mechanic Pittsburgh, Fort Wayne & Chicago Railway, Fort Wayne, Ind.

General Railroad News.

TRAFFIC AND EARNINGS.

Coal Movement.

Coal tonnages, so far as reported, for the year ending Dec. 31, were as follows, the tonnage in each case being that originating on the line given:

	1876.	1875.	Inc. or Dec.	P. c.
Anthracite:				
Philadelphia & Reading.	4,935,401	4,780,693	Inc ..	154,708	3.2
Northern Central, from Shamokin Div. and Summit Branch.....	939,223	1,190,775	Dec..	251,552	21.1
Danville, Hazleton & Wilkesbarre.....	41,736	69,887	Dec..	28,151	40.2
Central of N. J., Lehigh Division.....	2,830,032	2,407,140	Inc ..	422,892	17.6
Lehigh Valley	3,794,900	3,223,145	Inc ..	571,755	17.7
Pennsylvania & New York.....	26,862	88,246	Dec..	61,384	69.6
Pennsylvania Canal....	407,522	299,267	Inc ..	108,255	36.1
Delaware, Lackawanna & Western.....	2,005,969	2,941,560	Dec..	935,591	31.8
Delaware & Hudson Canal Co.....	2,006,509	3,056,479	Dec .	1,049,970	34.3
Pennsylvania Coal Co..	1,086,475	1,368 208	Dec..	281,733	20.6
State Line & Sullivan..	30,710	15,736	Inc ..	14,974	95.5
Total anthracite....	18,105,339	19,441,136	Dec..	1,335,797	6.9
Semi-bituminous:					
Cumberland, all lines..	1,800,755	2,268,729	Dec..	467,974	20.6
Huntingdon & Broad Top.....	159,789	219,367	Dec..	59,578	27.1
Tyrone & Clearfield....	1,218,861	928,297	Inc ..	290,564	31.3
Total semi-bitumin's	3,179,405	3,416,393	Dec..	236,988	6.9
Bituminous:					
Barclay R. R.....	357,159	376,637	Dec..	19,478	5.2

The reports for the Pennsylvania and its branches are not yet complete up to the close of the year. The anthracite tonnage of the Belvidere Division, Pennsylvania Railroad for the year was as follows:

	1876.	1875.	Inc. or Dec.	P. c.
To Coal Port, for shipment..	274,679	188,713	Inc ..	85,966	45.6
To South Amboy, for shipment.....	485,772	318,725	Inc ..	167,047	52.4
Local distribution on New Jersey lines	187,970	224,109	Dec..	36,139	16.1
Company's use on New Jersey lines.....	72,250	35,474	Inc ..	36,776	103.6
Total	1,020,671	767,021	Inc ..	253,651	33.1

Of the total in 1876 753,998 tons were from the Lehigh and 266,673 tons from the Wyoming Region. Actual shipments were: Coal Port, 284,423; South Amboy, 501,281; total 785,704; total, 1875, 530,609; increase, 255,095 tons, or 48.1 per cent.

The coal tonnage of the Chesapeake & Ohio Railroad for the year ending Sept. 30 was: 1875-76, 230,444; 1874-75, 178,510; increase, 51,934 tons, or 29.1 per cent.

It is reported that negotiations are in progress for a revival of the anthracite combination in some form, probably to regulate production and to prevent overstocking the market, without attempting to fix prices. Mr. Sloan, of the Delaware, Lackawanna & Western, is reported to declare that his company will have nothing to do with any combination.

The business of the Cumberland Region, in detail, for the year ending Dec. 30 was as follows:

	1876.	1875.	Decrease.	P.c.
By Baltimore & Ohio R. R., tons..	1,036,268	1,240,884	204,616	16.5
by Pennsylvania R. R.....	131,873	160,708	28,835	17.9
By Chesapeake & Ohio Canal.....	632,614	879,823	247,209	28.1
Total.....	1,800,755	2,281,415	480,660	21.1

The actual tonnage passing over the Pennsylvania & New York Railroad for the year ending Dec. 30 was as follows:

	1876.	1875.	Increase.	P.c.
Anthracite, tons.....	807,494	757,164	50,330	6.6
Bituminous.....	337,312	333,932	3,380	1.0
Total.....	1,144,806	1,091,096	53,710	4.9

The tonnage passing over the Huntingdon & Broad Top Railroad for the same year was:

	1876.	1875.	Decrease.	P.c.
Broad Top coal, tons.....	159,779	204,921	45,142	22.0
Cumberland.....	145,797	175,155	29,358	16.8
Total	305,576	380,076	74,500	19.6

Shipments of Nova Scotia coal from Pictou, N. S., for the year 1876 were 185,391 tons.

Petroleum Movement.

For four years the exports from the leading ports have been:

	1876.	1875.	1874.	1873.
New York.....	145,237,750	148,391,888	148,042,154	150,227,989
Boston.....	3,174,390	2,530,081	3,747,859	2,458,316
Philadelphia	67,020,806	63,783,615	72,355,676	87,513,013
Baltimore.....	40,599,744	25,364,853	7,526,735	2,416,512
Total	256,033,090	240,074,442	231,672,424	242,615,830

The percentage exported at each port each year has been:

	1876.	1875.	1874.	1873.
New York.....	56.7	61.8	63.9	61.9
Boston.....	1.2	1.0	1.6	1.0
Philadelphia	26.2	26.6	31.3	31.1
Baltimore.....	15.9	10.6	3.2	1.0
Total.. .....100.0	100.0	100.0	100.0	100.0

The production of crude petroleum for November, as reported by *Stowell's Petroleum Reporter*, was 786,480 barrels. Shipments of crude oil from the wells for the month were 795,925 barrels. The shipments of refined oil from Pittsburgh for the month were 62,533 barrels, of which 42,431 barrels went by the Pennsylvania and 20,102 barrels by the Baltimore & Ohio.

Cotton Movement.

For the four months from Sept. 1 to Dec. 29 the receipts of cotton at seaboard ports and the exports were, in bales:

	1876.	1875.	Increase.	P. c.
Receipts.....	2,562,063	2,340,686	221,377	9 9
Exports.....	1,327,550	1,254,656	72,894	5.8

The receipts are unusually large—22 per cent. more than in 1874, 33 per cent. more than in 1873, 48 per cent. more than in 1872, and 86 per cent. more than 1871. This year's crop is estimated as something smaller than last year's, but already the part marketed in four months is equal to 55 per cent. of last year's crop.

Railroad Earnings.

Earnings for various periods are reported as follows:

	1875-76.	1874-75.	Inc. or Dec.	P. c
Year ending Sept. 30:				
Cumberland Valley, Main Line.....	$547,994	$526,076	Inc ..	$21.918	4.2
Expenses.....	249,893	265,481	Dec..	15,588	5.9
Net earnings.....	$298,101	$260,595	Inc ..	$37,506	14.4
Earnings per mile.	6,683	6,416	Inc ..	267	4.2
Per cent. of exps..	45.60	50.46	Dec..	4.86	9.6
Cumberland Valley, leased lines.....	52,137	57,704	Dec..	5,567	9.6
Expenses.....	37,377	45,794	Dec..	8,417	18.4
Net earnings.....	$14,760	$11,910	Inc ..	$2,850	23.9
Earnings per mile.	1,212	1,342	Dec..	130	9.6
Per cent. of exps..	70.34	79.36	Dec..	9.02	11.4
Providence & Worcester	899,105	894,480	Inc ..	4,625	0.5
Expenses.....	679,103	653,221	Inc ..	25,882	4.0
Net earnings.....	$220,002	$241,259	Dec..	$21,257	8.8
Earnings per mile.	13,452	13,382	Inc ..	70	0.5
Per cent. of exps..	75.53	73.03	Inc ..	2.50	3.4
Worcester & Nashua.	545,966	494,410	Inc ..	51,556	10.4
Expenses	344,728	336,079	Inc ..	8,649	2.6
Net earnings.....	$201,238	$158,331	Inc ..	$42,907	27.1
Earnings per mile.	6,833	10,823	Dec..	3,990	36.9
Per cent. of exps..	63.14	67.98	Dec..	4.84	7.1
Woodstock.....	21,994	.....	.....	....
Earnings per mile.	1,571	.....	.....	....
Year ending Nov. 30:				
Lehigh Valley	$8,037,247	$7,318,068	Inc ..	$719,179	9.8
Expenses.....	3,842,750	3,262,862	Inc ..	579,888	17.8
Net earnings.....	$4,194,497	$4,055,206	Inc ..	$139,291	3.4
Per cent. of exps..	47.81	44.59	Inc ..	3.22	7.2
Macon & Brunswick.	$317,829	.....	.....	....
Expenses.....	307,055	.....	.....	....
Net earnings.....	$10,774	.....	.....	....
Earnings per mile.	1,613	.....	.....	....
Per cent. of exps..	96.62	.....	.....	....
North & South, of Georgia.	9,014	.....	.....	....
Expenses.....	8,682	.....	.....	....
Net earnings.....	$332	.....	.....	....
Earnings per mile.	392	.....	.....	....
Per cent. of exps..	96.47	.....	.....	....

	1876.	1875.			
Year ending Dec. 31:					
Atchison, Topeka & Santa Fe.....	$2,474,263	$1,513,343	Inc ..	$960,920	63.5
Burlington, Cedar Rapids & Northern	1,128,071	1,311,377	Dec..	183,306	14.0
Canada Southern....	1,681,348	1 254,386	Inc ..	426,962	34.0
Central Pacific.....	18,184,166	16,970,0 8	Inc ..	1,214,148	7.2
Chicago & Alton.....	4,966,349	4,656,764	Inc ..	309,585	6.6
Chi., Milwaukee & St. Paul.....	8,055,139	8,255,743	Dec..	200,604	2.4
Cincinnati, Lafayette & Chicago.....	369,815	399,295	Dec..	29,480	7.4
Denver & Rio Gra'de, Main Line.....	388,240	361,770	Inc ..	26,470	7.3
Illinois Central.....	7,050,747	7,802,556	Dec..	751,809	9.6
Indianapolis, Bloom. & Western.....	1,462,804	1,355,495	Inc ..	107,309	7.9
International & Gr't Northern.....	1,416,174	1,365,634	Inc ..	50,544	3.7
Missouri, Kansas & Texas	3,217,277	2,904,925	Inc ..	312,352	10.8
Peach Bottom.....	37,071	22,227	Inc ..	14,844	66.9
St. Louis, Alton & T. H., Belleville Line	497,923	561,868	Dec..	63,945	11.4
St. Louis, Kansas City & Northern	3,137,280	2,636,707	Inc ..	500,573	19.0
St. Louis, Iron Mt. & Southern.....	3,980,581	3,802,942	Inc ..	187,639	4.9
Toledo, Peoria & Warsaw.....	1,411,732	1,120,488	Inc ..	291,244	26.0
Eleven months ending Nov. 30:					
Union Pacific.....	$11,891,873	$11,090,681	Inc ..	$801,192	7.2
Expenses.....	5,013,017	5,114,294	Dec..	101,277	2.0
Net earnings.....	$6,878,856	$5,976,387	Inc ..	$902,469	15.1
Per cent. of exps..	42.13	46.12	Dec..	3.99	8.7
Month of November:					
Great Western, of Canada	$335,200	$354,000	Dec..	$18,800	5.3
Expenses.....	267,300	277,000	Dec..	9,700	3.5
Net earnings.	$67,900	$77,000	Dec..	$9,100	11.8
Per cent. of exps..	79.74	78.25	Inc ..	1.49	1.9
Month of December:					
Atchison, Topeka & Santa Fe.....	$192,128	$145,569	Inc ..	$46,559	32.0
Burlington, Cedar Rapids & Northern	90,488	110,803	Dec..	20,315	19.2
Canada Southern....	109,567	126,552	Dec..	16,985	13.4
Central Pacific.....	1,411,000	1,299,000	Inc ..	112,000	8.6
Chicago & Alton.....	380,172	369,312	Inc ..	10,860	2.9
Chicago, Milwaukee & St. Paul.....	610,000	747,893	Dec..	137,893	18.4
Cincinnati, Lafayette & Chicago.....	26,942	36,446	Dec..	9,504	26.1
Denver & Rio Gra'de, Main Line.....	29,089	37,322	Dec..	8,233	22.1
Denver & Rio Gra'de, Trinidad Ex.....	12,326	.....	.....	....
Illinois Central.....	503,140	679,434	Dec..	176,294	26.0
Ind., Bloomington & Western	113,656	140,815	Dec..	27,159	19.3
International & Great Northern.....	219,200	190,191	Inc ..	29,009	15.3
Missouri, Kansas & Texas.....	296,466	295,738	Inc ..	728	0.2
St. Louis, Alton & T. H., Belleville Line.	54,080	50,824	Inc ..	3,256	6.4
St. Louis, Kan. City & Northern.....	261,178	266,536	Dec..	4,358	1.6
St. Louis, Iron Mt. & Southern.....	486,300	497,650	Dec..	11,350	2.3
Toledo, Peoria & Warsaw	98,065	116,762	Dec..	18,697	16.0
Toledo, Wabash & Western.....	377,222	359,284	Inc ..	17,938	5.0

	1877.	1876.			
First week in January:					
Atchison, Topeka & Santa Fe.....	$25,411	$24,786	Inc ..	$625	2.5
Chicago, Milwaukee & St. Paul.....	85,000	115,067	Dec..	30,067	26.1
Missouri, Kansas & Texas.....	54,501	54,997	Dec..	496	0.9
St. Louis, Kan. City & Northern	48,920	47,995	Inc ..	925	1.9

	1876.	1875.			
Week ending Dec. 22:					
Great Western, of Canada.....	£10,541	£18 050	Dec..	£7,590	41.9
Week ending Dec. 23:					
Grand Trunk.....	£30,100	£40,500	Dec..	£10,400	25.7

Central Pacific earnings compared with 1874 are as follows:

	1876.	1874.	Increase.	P.c.
Month of December.....	$1,411,000	$1,370,334	$40,666	3.0
Twelve months.....	18,184,166	14,522,814	3,661,352	25.2

Grain Movement.

For the calendar year the receipts and shipments of grain of all kinds are reported as follows:

	1876.	1875.	Inc. or Dec.	P. c.
Flour:				
Lake ports' receipts....	5,578,950	5,022,510	Inc ..	556,440	11.1
Lake ports' shipments.	4,997,845	5,539,965	Dec..	542,120	9.8
Atlantic ports' receipts.	9,939,150	9,985,256	Dec..	46,106	0.5
Wheat:				
Lake ports' receipts....	55,834,141	70,669,657	Dec..	14,835,516	21.0
Lake ports' shipments .	48,799,613	57,899,899	Dec..	9,100,286	15.9
Atlantic ports' receipts.	42,740,235	54,718,327	Dec..	11,978,092	21.9
Corn:				
Lake ports' receipts....	81,054,249	48,989,721	Inc ..	32,064,528	65.4
Lake ports' shipments.	75,010,881	43,479,250	Inc ..	31,531,631	72 5
Atlantic ports' receipts.	86,775,163	56,285,243	Inc ..	30,489,920	54.4
Grain of all kinds:				
Lake ports' receipts....	173,561,877	154,063,413	Inc ..	19,498,464	12.6
Lake ports' shipments.	150,361,872	124,443,329	Inc ..	25,918,543	20.8
Atlantic ports' receipts.	163,694,941	136,963,146	Inc ..	26,731,795	19.5
Grain and Flour reduced to Grain:				
Lake ports' receipts....	201,456,627	179,175,963	Inc ..	22,280,664	12.4
Lake ports' shipments.	175,351,097	152,143,154	Inc ..	23,207,943	15.2
Atlantic ports' receipts.	213,390,691	186,889,426	Inc ..	26,501,265	14.2

The latter figures for four years have been:

	1876.	1875.	1874.	1873.
Lake ports' receipts..	201,456,627	179,175,963	202,047,119	199,335,053
Lake ports' shipm'ts.	175,351,097	152,143,154	156,767,156	167,089,026
Atlantic ports' rece'ts.	213,390,691	186,889,426	194,242,307	174,690,861

For the week ending Dec. 30 receipts and shipments of grain of all kinds are reported as follows, in bushels:

	1876.	1875.	Inc. or Dec.	P. c.
Lake ports' receipts.....	2,452,564	2,123,325	Inc ..	329,339	15.5
" " shipments.....	964,795	1,169,217	Dec..	204,422	17.5
Atlantic ports' receipts.....	1,882,838	1,600,724	Inc ..	282,114	17.6

Freight Rates on Live Stock.

At a meeting held in Chicago, Jan. 6, the following rates were agreed on for live stock bound eastward:

Chicago to	Hogs, per 100 lbs.	Cattle, horses or sheep, per 100 lbs.
Toledo or Detroit.....	16 cts.	18 cts.
Sandusky.....	18 "	20 "
Cleveland	20 "	22½ "
Dunkirk.....	22½ "	25 "
Buffalo, Suspension Bridge, Pittsburgh, East Liberty, Akron, Wheeling or Bellaire.....	25 "	27½ "
Baltimore.....	35 "	43½ "
Philadelphia.....	40½ "	45 "
New York.....	45 "	50 "

The minimum weights that will be taken and the standard car-loards are: Cattle or horses, 20,000 lbs. per car; sheep, 18,000 lbs. per double-deck, or 14,000 lbs. per single-deck car; hogs, 22,000 lbs. per double-deck, or 14,000 lbs. per single-deck car. The new rates took effect Jan. 9. The only change to New York is an advance of 5 cents per 100 lbs. on cattle, horses and sheep.

Minnesota Railroads in 1876.

The earnings, etc., of the following roads are given in the Minnesota Railroad Commissioners' report for the year ending June 30, 1876, only those roads being given which do not otherwise report:

	Tons freight carried.	Passengers carried.	Gross earnings.	Earn. per mile.
Central, of Minnesota.....	21,963	6,900	$46,030	$1,151
Lake Superior & Mississippi.....	235,898	59,776	566,479	3,352
Minneapolis & St. Louis.....	145,614	40,709	141,360	3,366
St. Paul & Pacific, Main Line.....	186,196	230,540	624,023	3,015
" " Branch.....	84,327	191,996	382,022	3,442
St. Paul, Stillwater & Taylor's Falls	.....	.....	79,879	3,328

The gross earnings of the 1,984 miles of road in the State were $6,000,968, being $3,025 per mile.

THE SCRAP HEAP.

The Danger of Cutting off Passes.

The Atlanta (Ga.) *Constitution* says that it suddenly found out from its country exchanges, a short time since, that the Georgia Railroad was in an alarming condition. The ties were rotten, the rails worn, the Oconee bridge was not safe, and no one with regard for his life and limbs would travel on such a road. The editor was puzzled to account for the sudden depreciation of what had always been considered a good road until his eye lighted on a circular headed "Georgia Railroad Company" and announcing that after Jan. 1 no free passes would be issued to members of the press. That explained it all.

Saving Wipers' Wages.

The Springfield *Republican* says: "The Boston & Albany people made a trial a few months since of the recent recommendation of a prominent railroad man to run engines without wiping. An engine was run on the Boston & Worcester Division about four months without rubbing down, and at the end of that time it was a sorry-looking sight. In fact, the trainmen used to say the machine looked so bad the road was ashamed to run it in the day-time, and it always ran nights until it was cleaned, since when the experiment has not been repeated."

The Philadelphia & Reading, however, reports that it has had satisfactory results after considerable experience in running engines without wiping.

OLD AND NEW ROADS.

Texas & Pacific.

This company has still a force employed in grading on the Arizona side of the Colorado River at Fort Yuma.

The bill now before the Pacific Railroad Committee of the House of Representatives is said to provide for a Government guarantee of 5 per cent., gold, interest for 50 years on an amount not to exceed $35,000 per mile for the main line and $30,000 for branches, the Government to have a first mortgage on the property and to retain all sums accruing for mail and military transportation. The main line on which the guarantee is to be given is from Fort Worth, Tex., to Fort Yuma, about 1,080 miles, the Texas & Pacific to build from Fort Worth to a point in New Mexico 100 miles west of El Paso, and the Southern Pacific from Fort Yuma to the same point; the latter company also to build a branch from its present line to San Diego. The branches provided for are: from a peint east of the 103d meridian to Vinita, the terminus of the St. Louis & San Francisco road; from Shreveport to Vicksburg (a part of this is already built): from Jefferson, Tex., to Memphis, and from Shreveport or Marshall to New Orleans.

It is said that the promoters of the bill have strong hopes of securing its passage at the present session of Congress.

Dayton & Southeastern.

At the annual meeting in Dayton, O., Jan. 8, Chief Engineer J. Blickensderfer, Jr., presented an elaborate report, from which it appears that the road will be one of very easy grades, on the main line, at any rate. The line located is the main line from Dayton to Sells', 107.28 miles, and a branch from Sells' to Wellston, 7.02 miles. On the main line the highest grade ascending eastward is 38 feet to the mile; westward, 26.4 feet. There are 82.46 miles tangent; the sharpest curve is 10° (573 feet radius), and there is but one of that radius. O

the Wellston Branch there is a grade of 79.2 feet per mile, but only a quarter of a mile long, and only 0.81 mile is over 26.4 feet to the mile; there is one 12° curve on the branch.

The road is now completed and in operation between Xenia and Washington Court House, 28¾ miles. Between Dayton and Xenia, 19 miles, the track is all laid but one mile, but the ballasting and surfacing are yet to be done. From Washington Court House to Musselman's, 21 miles, the grading and bridging are well advanced. From Musselman's to Byers', 33½ miles, but little has been done, and from Byers' to Wellston, 12¼ miles, the grading is nearly finished, but no bridging has been done. A commencement has been made at the Scioto River bridge. The total amount expended is $411,643; amount estimated to complete the road, $326,804. The estimate does not include sidings, buildings or equipment.

Baltimore & Ohio.

At the monthly meeting of the directors in Baltimore last week, President Garrett referred to the rapidly increasing grain trade of the road and the necessity of providing additional equipment and other facilities. He also spoke of the alleged bad condition of the New York Central equipment and he difficulty of meeting demands for cars. He said that a number of new grain cars had already been ordered for immediate use.

It was resolved to authorize the officers of the company to negotiate in England a new loan for $8,000,000 to be secured by mortgage on the Chicago Division, the proceeds to be used for additional equipment and shop facilities. The details of the new loan have not yet been arranged.

Missouri Pacific.

In the case of Cowdrey et al. agt. The Missouri Pacific Railroad Company to set aside the decree of sales, the United States Supreme Court, Jan. 16, denied the motion for the following reasons: "That they were not parties to the suit; that stockholders could not become parties except where it is shown that the directors are greatly negligent of their duties, and then only with great caution and as a matter of discretion with the Circuit Court, with which the Supreme Court will not interfere." This decision virtually closes all litigation, and ignores all the assumed rights of the stockholders of the Missouri Pacific Railroad Company.

Chicago, Burlington & Quincy.

Notice is given that this company will receive at its office in Boston until Jan. 27 proposals for $2,200,000 new 5 per cent. bonds having 25 years to run. Payments are to be made in three equal installments on Feb. 2, Feb. 26 and March 26. These bonds are part of an issue of $2,500,000, which are to be secured by the deposit with the trustees of an equal amount of 7 per cent. bonds secured by mortgage upon the St. Louis, Rock Island & Chicago road. The difference of 2 per cent. annually is to be applied by the trustees to a sinking fund for the final payment of the bonds. The proceeds of the bonds are to be used in paying for the St. Louis, Rock Island & Chicago road and in improvements of the property.

New Jersey & New York.

A meeting of holders of bonds of this company and its predecessors, the Hackensack & New York and the Hackensack & New York Extension companies, is called, to be held in Room 74, Drexel Building, New York, Feb. 6, at 2 p. m. The object is to secure concert of action among the bondholders.

Chicago & Pacific.

In the United States Circuit Court in Chicago, Jan. 15, a bill was filed for the foreclosure of the first-mortgage. The road is already in the hands of a receiver on application of the floating debt creditors, who are also the principal bondholders.

Bangor & Calais Shore Line.

The town committees of the towns interested in this road have joined in a request to the company for a suspension of expenditures, the towns which voted aid to settle the bills so far incurred. Nothing has yet been done except on the survey and location of the line, and that will probably be stopped, as the towns own nearly all the stock and the directors will probably not care to go on in opposition to their wishes.

Meetings.

Meetings will be held by the following companies at the times and places given:

Worcester & Nashua, annual, at the company's office in Worcester, Mass., Jan. 25, at 10 a. m.

Providence & Worcester, annual, at the passenger station in Providence, R. I., Feb. 5, at 10 a. m.

Long Branch & Sea Shore, annual, at Long Branch, N. J., Jan. 24.

Boston, Clinton, Fitchburg & New Bedford.

It is stated that this company will apply to the Massachusetts Legislature for authority to issue $2,000,000 preferred stock, to be used to fund the floating debt.

Tennessee & Pacific.

The interest of Davidson and Wilson counties, Tenn., was to be transferred to the Nashville, Chattanooga & St. Louis Company this week, giving that company control of the road, as there is less than $40,000 private stock, while the two counties hold $600,000. The road is 31 miles long, from Nashville, Tenn., eastward to Lebanon.

Kansas City & Northeastern.

This proposed road is to be run from Milan, Mo., on the Burlington & Southwestern, no theast to Glenwood, on the Northern Division of the St. Louis, Kansas City & Northern road, about 43 miles. The present intention is to complete it this year.

Valley, of Virginia.

The Shenandoah Valley Company surrendered its temporary lease of this road Jan. 10, and withdrew the trains. The Valley Company, however, has made arrangements to work the road itself, has taken possession, and is running trains regularly between Harrisonburg and Staunton. The passenger trains will be run to connect with the Baltimore & Ohio trains at Harrisonburg.

Pittsburgh, Virginia & Charleston.

At the annual meeting in Pittsburgh, Jan. 8, the traffic of the road for the year ending Dec. 30 was stated as follows:

	1876.	1875	Increase.	P.c.
Passengers carried	253,276	249,606	3,670	1.5
Tons freight carried	119,012	86,497	32,515	37.6

It is intended to extend the road from its present terminus at Monongahela City, 30 miles from Pittsburgh, to Brownsville, as soon as the bridge over the Monongahela at Port Perry and the connection there with the Pennsylvania are finished.

Minnesota Railroads in 1876.

The Railroad Commissioner of Minnesota, Hon. W. R. Marshall, reports that there are now 1,984 miles of railroad in the State. No new railroad was completed during the year ending June 30, 1876, but the Worthington & Sioux Falls road was opened to Luverne soon after its close. The railroads of the State during the year carried 2,079,563 tons of freight and 1,169,072 passengers; the gross earnings were $6,000,968; expenses, $4,182,140; net earnings, $1,818,828. The State taxes paid were $131,559. These companies have received 7,548,273 acres of land, of which 842,613 acres have been sold for $5,578,269. About 3,500,000 acres have been granted, but not yet deeded. The accidents include 3 passengers, 20 employes and 10 others killed; 12 passengers, 53 employes and 9 others injured, 65 of the casualties being attributed to the carelessness or misconduct of parties killed or hurt.

The report refers to the still incomplete condition of the chief line of the State, the St. Paul & Pacific, on which no work was done during the year.

Erie Railway Conductors' Mutual Relief Association.

The annual meeting was held in Hornellsville, N. Y., Jan. 9, with a fair attendance, although the snow blockade then prevailing had prevented many members from being present. Secretary May reported 230 members on the roll; the receipts for 1876 were $20,490.23. Of this $18,410 was paid on account of deaths of members: $864 for disability, and $1,216.23 for the expenses of the association. The average cost of insurance was about $13 on $1,000. It was decided to hold the next meeting at Elmira, June 12.

Georgia.

The directors of this company have resolved to issue no more free passes to members of the Legislature, editors or others. The only passes given will be to the Governor of the State, officers of other roads and officers and employes of the road when traveling on business connected with the road.

Ohio & Mississippi.

A meeting of stockholders was held in Cincinnati, Jan. 13, at which resolutions were passed charging bad management upon the officers of the company, protesting against the continuance of the present Receivers and presenting the name of Wm. D. Griswold as a fit person for the office of receiver.

New Orleans, St. Louis & Chicago.

Since the termination of the receivership of the whole road and the transfer of the former New Orleans, Jackson & Great Northern to the trustees, the section from Canton, Miss., to Fillmore, Ky., formerly the Mississippi Central, has been placed in charge of R. P. Neely as Receiver. Mr. Neely had previously been appointed Receiver of so much of the road as is in Tennessee, and on Jan. 1 took possession of the sections in Mississippi and Kentucky also.

Northern Pacific.

Mr. J. L. Hallett is contractor for the new branch or extension of the Pacific Division from Tacoma, Wash. Ter., to the Puyallup coal fields. He has already 260 men at work and will increase his force to 600 shortly.

Atchison, Topeka & Santa Fe.

A Lawrence (Kan.) dispatch says that this company has completed arrangements to build a new track from Lawrence to De Soto, on the Kansas City Branch, where its trains now use the St. Louis, Lawrence & Western track. The rental paid for the use of this 17 miles of track is now $10,000 and one-half the expenses of maintenance.

The Pacific Railroads and the Government.

The Senate Committee on Railroads has been considering a bill introduced by Senator Gordon, of Georgia, providing for the payment of fixed annual sums by the Union and Central Pacific companies as a sinking fund to provide for their indebtedness to the Government. A similar bill, introduced at the last session, is before the Senate, and the whole subject is to come up for discussion Jan. 23.

Chicago & Northwestern.

This company is building four new hotel cars to be run on its line between Chicago and Council Bluffs. In addition to the usual sleeping and day accommodations these cars have kitchens attached and are provided with all the necessary conveniences. These cars will be ready for use about March 1.

Portland & Rochester.

The city of Portland, the largest holder of this company's securities, has made application for the appointment of a receiver, and the case was to be heard at Saco, Me., Jan. 17.

The holders of the company's bonds held a meeting in Portland, Me., Jan. 15, and appointed a committee to confer with the Portland city officers and also with the directors of the company. There will probably be no opposition to the appointment of a receiver.

St. Louis & Southeastern.

The following order has recently been issued by Gen. J. H. Wilson, Receiver and General Manager:

"As considerable loss of revenue has arisen from the unnecessary delay in unloading cars carrying company freight, such as bridge timber, cross ties, lumber, iron rails, wood, sand and coal, the following rule is published for the government of all concerned.

"Cars must be unloaded within 24 hours after their arrival at destination, and the fact will be reported by telegraph to the Assistant General Superintendent.

"Heads of departments will be held responsible for the strict enforcement of this order."

North & South of Georgia.

The Receiver reports as follows for the year ending Nov. 30:

Gross earnings ($392 per mile)	$9,013 95
Expenses (96.46 per cent.)	8,681 63
Net earnings ($14 per mile)	$332 32

The shortness of the road and the nature of the country do not give any prospect for an increase of business. The Receiver thinks that the road should be extended about 12 miles beyond the present terminus, most of the grading for that distance being done. The Governor transmits the report to the Georgia Legislature with the recommendation that the State dispose of the property as soon as possible, even if it is necessary to do so at a considerable loss.

Cape Girardeau & State Line.

The United States Circuit Court has decided to remand to the Missouri State Court for the Cape Girardeau circuit the suit brought to set aside a certain mortgage on the property of this company. Some time since some of the defendants had it removed to the United States Court, but it is now returned to the State Court.

Memphis Branch.

The Governor of Georgia reports to the Legislature that he has taken possession of this road, of which only five miles are completed, the company having failed to provide for the interest on $34,000 of bonds endorsed by the State. It is now in charge of Robert T. Fouche as State Agent. The Legislature is asked to take some action with respect to the road.

New York Central & Hudson River.

On the morning of Jan. 12 a singular accident occurred at the Grand Central Depot in New York. A mass of snow and ice on the highest part of the roof became loosened by the warmth of the sun, slid off and fell upon the glass of the next section, some six feet below. The thick plates of glass were broken to pieces for about two-thirds of the length of the building, and the snow, ice and broken glass fell upon one of the inward-bound platforms below. Fortunately the platform was empty and no person was hurt, though the horses of two street cars standing there were badly cut and injured.

The line between Albany and Buffalo was worked under great difficulties during last week and the early part of the present week, owing to the heavy snow storms, which followed each other with very brief intermissions. Passenger trains were worked through with many delays, in one case a train only making 57 miles in 15 hours, and for several days freight trains were almost abandoned. In several cases stock suffered severely, and the damage to equipment must have been considerable. The four tracks of the road could not be kept clear with plows as an ordinary double track is, and much of the work of clearing the road has had to be done by shoveling, which is, of course, slow work and requires a large number of men. Some experiments are to be made with a plow especially designed for the four-track road, which is being fitted up in the Albany shops.

Macon & Brunswick.

In his recent message the Governor of Georgia states the operations of this road for the year ending Nov. 30, as follows:

Gross earnings ($1,613 per mile)	$317,829 18
Expense account (96.62 per cent.)	307,054 78
Balance	$10,774 40
Add balances due from other roads	47,701 32
Total	$58,475 72

Of these balances due $18,097.62 have been collected. The policy of the management has been to improve the condition of the road as much as possible. Proposals have been invited for the sale or lease of the road; if no acceptable bid is received some action by the Legislature will be required.

Parker & Turkey City.

It is proposed to build a narrow-gauge road from Parker, Pa., northward by way of Foxburg and Petersburg to Turkey City, about 10 miles, and it is said that the Parker & Karns City Company will iron and equip the road if the grading can be done. The road will reach the Clarion oil district, which the Emlenton & Shippenville road is being built to serve.

Oley Valley.

Meetings continue to be held in aid of this projected line from Friedensburg, Pa., to the Reading road, and committees have been appointed to secure subscriptions and to have surveys and estimates made.

Kent County.

This road, which extends from Massey's, Md., to Chestertown, 31 miles, is to be sold Feb. 15 under foreclosure of the first mortgage.

North Carolina.

At a recent meeting of the directors it was resolved to pay 6 per cent. annually on the stock hereafter. The payment will be made in two semi-annual dividends, to be paid April 1 and Sept. 1. The road is leased to the Richmond & Danville Company.

Waterville & Washington.

The formal opening of this road was celebrated by an excursion and public meeting Jan. 11. The road is 21 miles long, from Waterville, Kan., to Washington, and is worked by the Central Branch Company, of whose line it is an extension.

Wilmington & Reading.

The bondholders who bought this road at foreclosure sale have completed arrangements to organize a new company, to be known as the Wilmington & Northern Railroad Company. The meeting for organization is to be held in Philadelphia, Jan. 23.

Somers Point & Absecom.

Books of subscription to the stock of this company have been opened and a considerable amount has been subscribed. The road is to run from Somers Point, N. J., on Great Egg Harbor, north by east to Absecom, about nine miles.

Pittsburgh, Titusville & Buffalo.

The Pennsylvania Supreme Court has affirmed the decision of the Circuit Court under which the Pennsylvania Transportation Company last year obtained a judgment for about $195,000 against the Oil Creek & Allegheny Valley Company for breach of contract.

St. Croix & Penobscot.

An extension of this road from its present terminus at Princeton, Me., northward to the most convenient point on the European & North American road was proposed long since, and measures are now being taken to secure its construction.

Rutherford & Spartanburg.

A company by this name asks for a charter to build a railroad from Rutherfordton, N. C., southward to Spartanburg, S. C., about 40 miles.

Quincy & Rushville.

Citizens of Clayton, Ill., have offered to grade and tie several miles of this projected road, provided the company will agree to complete the road to their town.

Loami & Springfield.

Meetings are being held to advocate the construction of a road from Loami, Ill., northward about four miles to Bates on the Toledo, Wabash & Western. A company is to be organized to build the road.

Illinois Central.

The Land Department reports for December sales of 680 acres of land for $4,985, and cash collections on land contracts amounting to $14,564.62,

The Traffic Department reports earnings for December as follows:

	1876.	1875.	Decrease.	P. c.
In Illinois, 707 miles	$397,619 12	$508,391 97	$110,772 85	21.6
In Iowa, 402 miles	105,521 58	171,042 08	65,520 50	38.3
Total, 1,169 miles	$503,140 70	$679,434 05	$176,293 35	25.9

The Illinois earnings were $562, and the Iowa earnings $262 per mile, the average for the whole road being $454 per mile.

Indianapolis, Cincinnati & Lafayette.

A number of holders of the equipment bonds have signed a call to the trustees to take some action, the interest being in default since Sept. 1, 1876.

Port Royal.

In the United States Circuit Court a decree of foreclosure and sale has been entered against this road. The terms of sale are one-third cash and the balance in three equal semi-annual installments, secured by mortgage on the property. The amount of the bonds due is fixed at $2,500,000. The former order of sale was granted by a South Carolina Court, but the present order is substantially the same.

Hudson Tunnel.

This company has taken an appeal to the Circuit Court from the award of the Commissioners, who condemned the land taken by it in Jersey City, on the ground that the award is too high. It is said that an agreement has been concluded with the Delaware, Lackawanna & Western, that company agreeing to withdraw its opposition on condition that the Tunnel Company condemn none of its lands east of Prospect street.

New York & Oswego Midland.

The Receivers have withdrawn train service from the Ellenville Branch and removed all the property of the road which can be carried away. This action is taken on account of trouble about taxes, the Receivers believing that the branch line is assessed at too high a figure.

New York & Manhattan Beach.

Contracts have been let for the construction of this road, and it is said that work will be begun as soon as the weather

will permit. The road is to be of 3-ft. gauge and is intended for suburban and pleasure travel. It is to run from the Greenpoint Ferry, North Fifteenth street, Brooklyn, eastward to the Bushwick Meadows, thence southward to East New York and to a connection with the New York, Bay Ridge & Jamaica road, whose line will be followed to Bay Ridge, with a branch to Coney Island. The whole length of road to be built, including the Coney Island Branch, is about 18 miles.

Peoria & Rock Island.

Receiver Hilliard's report for October is as follows:

Balance, Oct. 1	$10,395 80
Receipts	30,516 17
Total	$40,911 97
Disbursements	29,972 32
Balance, Nov. 1	$10,939 65

The receipts exceeded the disbursements by $543.85.

In the United States Circuit Court in Chicago, Jan. 12, a final decree of foreclosure and sale was ordered to be entered. The sale is to be made by H. W. Bishop, Master, after due advertisement, and will include the 92 miles of road, with all the buildings and other property and the equipment, consisting of 8 engines, 7 passenger and baggage and 90 freight cars. The sale will be made subject to $150,000 bonds issued by the old Rock Island & Peoria Company, and to a contract with the Coal Valley Mining Company, under which that company is entitled to a royalty of 25 cents per ton on all coal carried over the road. The amount of the bonds and unpaid coupons is $1,756,666.66. The purchaser will be required to pay $100,000 in cash, but may pay the balance in bonds and overdue coupons.

Omaha & Republican Valley.

Butler County, Nebraska, has voted to issue $119,000 in bonds in aid of the proposed extension of this road from Wahoo, Neb., westward through the county.

Northern, of California.

This branch of the California Pacific is now completed to a point seven miles above Williams, the late terminus, and 45 miles from the junction with the California Pacific at Woodland.

Texas Western.

Trains are now running regularly to Wimberly, 30 miles west of Houston, Tex. Contracts have been let for a further section of 20 miles, which will carry the road across the Brazos River and within three miles of Belleville. The iron for this section is on hand.

Connecticut Western.

At a meeting held in Hartford, Jan. 13, the stockholders voted to approve the plan proposed for the issue of 7 per cent. preferred stock in place of the present first-mortgage bonds, the bonds to be deposited in trust, as collateral security, and the common stockholders to have the right to redeem the preferred stock at par and accrued interest. The plan really amounts to a surrender of the control of the road to the bondholders, and the acceptance by the latter of the net earnings in lieu of their interest.

Southern Pacific.

This company has lately completed a branch from Goshen, Cal., westward across the valley to Grangeville, 50 miles. It is part of the connecting link between the company's coast line and its Los Angeles line. At the terminus a new town has been established and called Grangeville.

Work has been begun on a second or loop line from San Francisco south by east to San Bruno, about 12 miles. The new line will follow the coast for the most part, will be somewhat shorter and have lighter grades than the existing line.

Bellaire & Southwestern.

A large force is at work grading this line near Beallsville, O., and tracklaying will be begun in a month or two.

New York Elevated.

This company's securities have been put on the list at the New York Stock Exchange. The statement made is as follows: Main Line from Battery Place to Sixty-first street, 5 miles; sidings, 2 miles; South Ferry Extension, nearly completed, three tracks, 0¾ mile; 14 stations, 16 engines and 34 passenger cars. The capital account is as follows:

Stock paid up	$1,050,000
Bonds sold	1,090,000
Floating debt	412,000
Required to complete South Ferry Extension	30,000
Total	$2,442,000

To pay the floating debt and improve the road the company purposes issuing $450,000 stock and $730,000 bonds, which will make the stock $1,500,000 and the bonds $1,730,000; total, $3,230,000, being $561,739 per mile of road, or $349,189 per mile of track. In October, 1876, the road earned $22,650 gross, and $10,650 net, against $11,398 gross and $4,979 net in October, 1875, an increase of 98.7 per cent. in gross, and 113.9 per cent. in net earnings.

South Pacific Coast.

The line of this road has been finally located over the Southern Division from Los Gatos to Santa Cruz. The line adopted runs up from Los Gatos to Mountain Charley's, where a long tunnel will carry it through to the head waters of Cyante Creek, then runs down the Cyante Valley to the San Lorenzo nearly opposite Felton, and down the east side of the San Lorenzo to Santa Cruz. This line is the shortest found and, with the exception of the tunnel, is said to be an easy one to build.

Erie.

The Receiver's report for October and November is as follows:

Balance, Oct. 1		$408,943 09
Receipts for October		2,210,946 32
" " November		2,055,968 01
Total		$4,675,857 42
Disbursements for October	$2,200,239 93	
" " November	1,892,039 43	
		4,092,279 36
Balance, Dec. 1		$583,578 06

The receipts exceeded the disbursements by $10,706.39 in October, and $163,928.58 in November, being $174,634.97 for the two months. The receipts from Receiver's certificates were $135,521.10. The Receiver reports that all arrears of wages are paid up and that the employes will be paid regularly hereafter.

New Orleans, Jackson & Great Northern.

A meeting of the consolidated bondholders is to be held in the Illinois Central office, No. 31 Nassau street, New York, Feb. 15, for the purpose of concerting measures for the purchase of the road at the approaching foreclosure sale, and for the organization of a new company. The foreclosure sale is to take place in New Orleans, March 17.

Ohio Central.

The track on this road (formerly the Atlantic & Lake Erie) is now laid to the crossing of the Pittsburgh, Cincinnati & St. Louis and Baltimore & Ohio track, 4½ miles west of Newark, O. This crossing is 17 miles northward from Pleasantville, the last point noted, and 28 miles from the Cincinnati & Muskingum Valley Junction at Bremen. The connection at the Pittsburgh, Cincinnati & St. Louis crossing has been made, the west arm of the Y there being laid. Ties are being distributed along the line northward towards Granville and tracklaying will be resumed as soon as the weather permits.

Cleveland & Pittsburgh.

The Farmers' Loan & Trust Co., Trustee, gives notice that 16 of the construction and equipment bonds have been drawn for redemption by the sinking fund and will be paid in full, with accrued interest, on presentation at the Trustee's office in New York. Interest will cease July 1, 1877, on these bonds, the numbers of which are: 56, 449, 584, 676, 709, 711, 739, 867, 883, 888, 925, 945, 959, 960, 1100, 1342.

Indianapolis, Bloomington & Western.

In the United States Circuit Court at Chicago, Jan. 9, the Court made an order denying the petition filed some time since for the removal of Gen. Wright, the present Receiver, but granting leave to the applicants to file a new and amended petition. The new petition was at once filed and the court referred it to H. W. Bishop, Master, to take evidence in the matter.

East River Bridge.

At a meeting of the trustees held Jan. 11, the Executive Committee presented a report in favor of giving the contract for the main cables to John A. Roebling's Sons & Co., of Trenton, N. J. After considerable discussion the report was referred back to the committee with instructions to receive new proposals for cables to be made of Bessemer steel wire.

At a subsequent meeting the trustees rescinded the resolution calling for bids for Bessemer steel wire, and resolved to award the contract for wire for the main cables to J. Lloyd Haigh, of Brooklyn, at 8.7 cents, gold, per pound, for crucible cast steel wire. The whole amount of the contract is about $600,000.

New York, New Haven & Hartford.

At the annual meeting in New Haven, Jan. 10, the irrepressible stockholder, Mr. Goodwin, appeared as usual, this time with a proposition to run passenger trains on which only 2 cents per mile should be charged. President Bishop said that, including commutation tickets, the average charge was now only about 2½ cents per mile. Transient fares might be reduced to 2 cents per mile, if the stockholders would be content to take 6 instead of 10 per cent. dividends. Mr. Goodwin called for a stock vote, but objections were made and the proposition was withdrawn. Mr. Goodwin then offered some resolutions which were not considered. Another stockholder began a verbal protest against the running of trains on Sunday, but was cut short by an adjournment.

ANNUAL REPORTS.

Chesapeake & Ohio.

This company works a line from Richmond, Va., to Huntington, W. Va., 425.82 miles, including the extension to the James River wharves; the Lowmoor Branch, 2.18 miles; the Quinnimont Coal Branch, 1.05 miles, and the Coal River Branch. 1.33 miles, making 430.38 miles in all. The equipment consists of 76 engines; 29 passenger, 4 sleeping, 1 observation and 16 baggage, mail and express cars; 840 box, 103 stock, 346 platform and gondola, 669 eight-wheel coal, 254 four-wheel coal and 2 drovers' cars; 1 officers', 1 pay, 4 derrick, 137 gravel and 100 dump cars. Five engines were bought during the year and five heretofore leased were purchased.

The present report covers the year ending Sept. 30, 1876, during which the road has been in the hands of a receiver under proceedings for foreclosure of mortgage. Plans have been prepared for the purchase and reorganization of the road by the bondholders. The plan adopted provides for an issue of $18,628,578 ($43,322 per mile) of first-mortgage bonds, $10,000,000 income bonds, and $28,982,925 stock of various classes, making a total of $57,611,503, or $133,980 per mile. The existing mortgage debt, not including overdue interest, amounts to $21,744,000.

The freight tonnage for the year was as follows:

	1875-76.	1874-75.	Increase.	P. c.
Tons carried	415,462	359,569	55,893	15.5
Tonnage mileage	97,633,570	57,890,000*	39,743,570	68.6

* About.

The average haul was increased by nearly 55 miles. The coal tonnage was: 1875-76, 230,444; 1874-75, 178,510; increase, 51,934 tons, or 29.1 per cent.

The earnings for the year were as follows:

	1875-76.	1874-75.	Inc. or Dec.	P. c.
Passengers	$365,865 41	$409,626 71	Dec.. $43,761 30	10.7
Freight	1,177,942 36	993,862 50	Inc.. 184,079 86	18.5
Express and mails	53,340 87	53,247 38	Inc.. 93.49	0.2
Miscellaneous	2,363 91	2,452 89	Dec.. 88.98	3.6
Total	$1,599,512 55	$1,459,189 48	Inc.. $140,323 07	9.6
Expenses	1,243,035 95	1,112,320 70	Inc.. 130,715 25	11.8
Net earnings	$356,476 60	$346,868 78	Inc.. $9,607 82	2.8
Gross earn. per mile	3,716 51	3,390 46	Inc.. 326 05	9.6
Net earnings per mile	828 28	805 96	Inc.. 22 32	2.8
Per cent. of expenses	77.72	76.23	Inc.. 1.49	2.0

The net earnings for the last year were sufficient to pay 6 per cent. on a capital account of $13,805 per mile. The decrease in passenger earnings was due chiefly to the light travel to the Virginia springs, which is attributed to the superior attractions of the Centennial. The increase in freight earnings was less than that in traffic, owing to the very low rates obtained for through freight.

Included in expenses was $88,068.53 expended for renewal of track. About 400 tons of iron and 700 tons of steel rails were laid; temporary structures were replaced by permanent ones in several places and the condition of the road generally improved. Payments for five engines heretofore leased were completed and a considerable amount paid on five new engines bought from the Danforth Locomotive Works.

Philadelphia, Wilmington & Baltimore.

This company owns a line from Philadelphia to Baltimore, 95.5 miles, with an extension, known as the Southwark Railroad, in Philadelphia, 1.75 miles; a branch from Perryville to Port Deposit 3.75 miles; the New Castle & Wilmington road, from Wilmington, Del., to New Castle, 5.5 miles, and the New Castle & Frenchtown road, from New Castle to the Delaware Railroad Junction, 6 miles, making in all 112.5 miles, of which 99.25 miles are owned directly and the rest indirectly, through ownership of stock. It also leases the Delaware Railroad, whose accounts are kept separately. The present report covers the year ending Oct. 31, 1876.

The equipment consists of 78 engines; 127 passenger, 2 parlor, 4 chair, 17 smoking and baggage, 1 postal, 25 baggage, 15 express and 3 milk cars; 683 box, 73 stock, 318 platform, 50 lime, 55 dump and 77 lumber cars; 1 pay, 3 wood, 5 tool, 2 crane and 3 construction cars, 1 snow-plow, and 1 street sweeper; a total of 194 passenger-train, 1,256 freight train and 16 service cars. The increase during the year was 6 engines, 32 passenger, 2 parlor, 1 smoking and baggage and 2 express cars; one engine was sold and one broken up and two bought to replace them.

The capital account at the close of the year was as follows:

Capital stock ($102,767 per mile)		$11,561,250 00
Convertible bonds	$265,000	
Other bonds	2,501,000	
Ground rents	10,000	
Total bonded debt ($24,676 per mile)		2,776,000 00
Dividend and interest account		132,767 20
Renewal fund		296,456 56
Balance of revenue accounts		545,382 50
Total ($136,105 per mile)		$15,311,856 26

The assets, besides road and equipment, include real estate not needed for the road, valued at $263,261.05; stocks and securities at cost, $953,836.41; Junction Railroad stock, $86,561.68; Southwark Railroad stock, $52,878.75; New Castle & Wilmington stock, $150,000; New Castle & Frenchtown stock, $150,000, Delaware Railroad stock, $443,251.62; Eastern Shore stock, $263. During the year $25,000 convertible bonds were exchanged for stock.

The locomotive mileage for the year was as follows:

	Main Line.	N. C. & W. R. R.	N. C. & F. R. R.	Delaware R. R.	Total.
Passenger	1,003,864	22,996	10,297	108,837	1,145,994
Freight	647,739	21,792	16,945	155,294	841,770
Service	43,226	1,211	527	5,608	50,572
Total	1,694,829	45,999	27,769	269,739	2,038,336

There was an increase in the Main Line mileage of 221.113 miles, or 15 per cent., and in the total mileage of 197,282 miles, or 10.7 per cent.

The earnings for the year were as follows:

	1875-76.	1874-75.	Inc. or Dec.	P. c.
Passengers	$2,358,080 10	$1,749,815 07	Inc.. $608,265 03	34.8
Freight and express	1,000,677 66	1,186,939 43	Dec.. 186,261 77	15.7
Rents	9,256 60	9,856 03	Dec.. 599 43	6.0
Mails and miscellaneous	88,121 83	99,560 55	Dec.. 11,438 72	11.5
Total	$3,456,136 19	$3,046,171 08	Inc.. $409,965 11	13.5
Working expenses	1,767,091 45	1,723,485 86	Inc.. 33,605 59	1.9
Taxes, State and local	77,790 77	82,381 63	Dec.. 4,590 86	5.6
Total	$1,834,882 22	$1,805,867 49	Inc.. $29,014 73	1.6
Net earnings	$1,621,253 97	$1,240,303 59	Inc.. $380,950 38	30.7
Gross earnings per mile	30,721 21	27,077 00	Inc.. 3,644 21	13.5
Net earnings per mile	14,411 15	11,025 00	Inc.. 3,386 15	30.7
Per cent. working expenses	50.84	56.58	Dec.. 5.74	10.1
Per cent expenses and taxes	53.09	59.28	Dec.. 6.19	10.4

These earnings and expenses were divided as follows.

	Earnings.	Working expenses.	Net earnings.	Earn. per mile.	P. c. of exps.
P., W. & B. R. R.	$3,305,437 87	$1,651,602 63	$1,653,835 24	$32.727	49.97
New Castle & Wilmington	81,887 19	57,321 03	24,566 16	14,889	70.00
New Castle & Frenchto'n.	68,811 13	48,167 79	20,643 34	11,469	70.00
Total	$3,456,136 19	$1,757,091 45	$1,699,044 74	$30,721	50.84

The increase in passenger receipts on the Main Stem alone was $603,900.07. This great increase was due entirely to the large travel to the Centennial Exhibition at Philadelphia. The decrease in freight earnings was due partly to a reduction of rates and partly to the light fruit business from Delaware. This fruit traffic for five years past was as follows:

	1876.	1875.	1874.	1873.	1872.
Car-loads peaches	2,117	9,072	1,266	2,853	4,091
Car-loads berries	882	905	714	688	565
Total car loads	2,999	9,977	1,980	3,541	4,656
Weight in tons carried	24,455	92,068	18,102	32,560	38,466

The revenue from this source was 60 per cent. less than in the previous year. It will be seen that the peach traffic is extremely variable, but that in small fruits is much steadier.

The income account may be summed up as follows:

Balance from 1875		$538,608 23
Net earnings		1,621,253 97
Total		$2,159,682 20
Balance of interest account	$15,234 00	
Depreciation of materials on hand	15,756 48	
Subscription to Centennial stock, balance	18,000 00	
Loss on Delaware Railroad lease	25,693 09	
Improvements and new equipments	365,836 13	
Renewal fund	250,000 00	
Dividends, 8 per cent	923,960 00	
		1,614,479 70
Balance, Nov. 1, 1876		$545,382 50

The balance of interest account is obtained by deducting interest on securities, etc., received from that paid. The improvements made consisted in new stations, new fencing, new sidings, additional right of way and tracks on the Darby Improvement, block signals, and chiefly in the new freight house and in improvements of the passenger house in Philadelphia. The new equipment was made necessary by the Centennial travel. Expenditures from renewal fund, chiefly for the Susquehanna and Big Elk bridges, were $139,259.66.

The usual course of the company has been to charge all improvements to expenses; this year, however, so large an amount was expended, that it was considered only just to charge part of it to construction account.

During the past year 785 tons of steel rails were used in renewals, leaving only 13 miles of iron track in the Main Stem, which will be relaid with steel during the current year. The property is left in good condition after the heavy passenger traffic of the year, which was very successfully handled by the officers of the road.

The Delaware Railroad lease has been renewed for 21 years, with this change, that the rental, which has been heretofore 30 per cent. of gross receipts, is to be hereafter 6 per cent. on the stock and debt of the Delaware Company. Should the net earnings in any year be insufficient to pay this, the deficiency is to be a charge against the future earnings.

The report is accompanied by a map of the road, a plan of the new stations in Philadelphia, and by views of those stations and of the new round-house in Wilmington.

Trial of Atmospheric and Vacuum Brakes.

Owing to the great increase of the speed of railroad trains and from other causes, the importance of efficient train-brakes has during the last few years attracted a great deal of attention in England. A little more than a year ago arrangements were made by the Railway Companies' Association of England for a series of trials of continuous train brakes. These trials were made under the auspices of that Association for the purpose, as stated by *Engineering*, of eliciting information for the "public generally and railway companies in particular, and of affording information to the Royal Commission now inquiring into railway accidents and the means of their prevention." An

the Wellston Branch there is a grade of 79.2 feet per mile, but only a quarter of a mile long, and only 0.81 mile is over 26.4 feet to the mile; there is one 12° curve on the branch.

The road is now completed and in operation between Xenia and Washington Court House, 28¾ miles. Between Dayton and Xenia, 19 miles, the track is all laid but one mile, but the ballasting and surfacing are yet to be done. From Washington Court House to Musselman's, 21 miles, the grading and bridging are well advanced. From Musselman's to Byers', 33¼ miles, but little has been done, and from Byers' to Wellston, 12¼ miles, the grading is nearly finished, but no bridging has been done. A commencement has been made at the Scioto River bridge. The total amount expended is $411,643; amount estimated to complete the road, $326,804. The estimate does not include sidings, buildings or equipment.

Baltimore & Ohio.

At the monthly meeting of the directors in Baltimore last week, President Garrett referred to the rapidly increasing grain trade of the road and the necessity of providing additional equipment and other facilities. He also spoke of the alleged bad condition of the New York Central equipment and he difficulty of meeting demands for cars. He said that a number of new grain cars had already been ordered for immediate use.

It was resolved to authorize the officers of the company to negotiate in England a new loan for $8,000,000 to be secured by mortgage on the Chicago Division, the proceeds to be used for additional equipment and shop facilities. The details of the new loan have not yet been arranged.

Missouri Pacific.

In the case of Cowdrey et al. agt. The Missouri Pacific Railroad Company to set aside the decree of sales, the United States Supreme Court, Jan. 16, denied the motion for the following reasons: "That they were not parties to the suit; that stockholders could not become parties except where it is shown that the directors are greatly negligent of their duties, and then only with great caution and as a matter of discretion with the Circuit Court, with which the Supreme Court will not interfere." This decision virtually closes all litigation, and ignores all the assumed rights of the stockholders of the Missouri Pacific Railroad Company.

Chicago, Burlington & Quincy.

Notice is given that this company will receive at its office in Boston until Jan. 27 proposals for $2,200,000 new 5 per cent. bonds having 25 years to run. Payments are to be made in three equal installments on Feb. 2, Feb. 26 and March 26. These bonds are part of an issue of $2,500,000, which are to be secured by the deposit with the trustees of an equal amount of 7 per cent. bonds secured by mortgage upon the St. Louis, Rock Island & Chicago road. The difference of 2 per cent. annually is to be applied by the trustees to a sinking fund for the final payment of the bonds. The proceeds of the bonds are to be used in paying for the St. Louis, Rock Island & Chicago road and in improvements of the property.

New Jersey & New York.

A meeting of holders of bonds of this company and its predecessors, the Hackensack & New York and the Hackensack & New York Extension companies, is called, to be held in Room 74, Drexel Building, New York, Feb. 6, at 2 p. m. The object is to secure concert of action among the bondholders.

Chicago & Pacific.

In the United States Circuit Court in Chicago, Jan. 15, a bill was filed for the foreclosure of the first-mortgage. The road is already in the hands of a receiver on application of the floating debt creditors, who are also the principal bondholders.

Bangor & Calais Shore Line.

The town committees of the towns interested in this road have joined in a request to the company for a suspension of expenditures, the towns which voted aid to settle the bills so far incurred. Nothing has yet been done except on the survey and location of the line, and that will probably be stopped, as the towns own nearly all the stock and the directors will probably not care to go on in opposition to their wishes.

Meetings.

Meetings will be held by the following companies at the times and places given:

Worcester & Nashua, annual, at the company's office in Worcester, Mass., Jan. 25, at 10 a. m.

Providence & Worcester, annual, at the passenger station in Providence, R. I., Feb. 5, at 10 a. m.

Long Branch & Sea Shore, annual, at Long Branch, N. J., Jan. 24.

Boston, Clinton, Fitchburg & New Bedford.

It is stated that this company will apply to the Massachusetts Legislature for authority to issue $2,000,000 preferred stock, to be used to fund the floating debt.

Tennessee & Pacific.

The interest of Davidson and Wilson counties, Tenn., was to be transferred to the Nashville, Chattanooga & St. Louis Company this week, giving that company control of the road, as there is less than $40,000 private stock, while the two counties hold $600,000. The road is 31 miles long, from Nashville, Tenn., eastward to Lebanon.

Kansas City & Northeastern.

This proposed road is to be run from Milan, Mo., on the Burlington & Southwestern, no theast to Glenwood, on the Northern Division of the St. Louis, Kansas City & Northern road, about 43 miles. The present intention is to complete it this year.

Valley, of Virginia.

The Shenandoah Valley Company surrendered its temporary lease of this road Jan. 10, and withdrew the trains. The Valley Company, however, has made arrangements to work the road itself, has taken possession, and is running trains regularly between Harrisonburg and Staunton. The passenger trains will be run to connect with the Baltimore & Ohio trains at Harrisonburg.

Pittsburgh, Virginia & Charleston.

At the annual meeting in Pittsburgh, Jan. 8, the traffic of the road for the year ending Dec. 30 was stated as follows:

	1876.	1875	Increase.	P.c.
Passengers carried	253,276	249,606	3,670	1.5
Tons freight carried	119,012	86,497	32,515	37.6

It is intended to extend the road from its present terminus at Monongahela City, 30 miles from Pittsburgh, to Brownsville, as soon as the bridge over the Monongahela at Port Perry and the connection there with the Pennsylvania are finished.

Minnesota Railroads in 1876.

The Railroad Commissioner of Minnesota, Hon. W. R. Marshall, reports that there are now 1,984 miles of railroad in the State. No new railroad was completed during the year ending June 30, 1876, but the Worthington & Sioux Falls road was opened to Luverne soon after its close. The railroads of the State during the year carried 2,079,563 tons of freight and 1,169,072 passengers; the gross earnings were $6,000,968; expenses, $4,182,140; net earnings, $1,818,828. The State taxes paid were $131,559. These companies have received 7,548,273 acres of land, of which 842,613 acres have been sold for $5,578,269. About 3,500,000 acres have been granted, but not yet deeded. The accidents include 3 passengers, 20 employes and 10 others killed; 12 passengers, 53 employes and 9 others injured, 65 of the casualties being attributed to the carelessness or misconduct of parties killed or hurt.

The report refers to the still incomplete condition of the chief line of the State, the St. Paul & Pacific, on which no work was done during the year.

Erie Railway Conductors' Mutual Relief Association.

The annual meeting was held in Hornellsville, N. Y., Jan. 9, with a fair attendance, although the snow blockade then prevailing had prevented many members from being present. Secretary May reported 230 members on the roll; the receipts for 1876 were $20,490.23. Of this $18,410 was paid on account of deaths of members: $864 for disability, and $1,216.23 for the expenses of the association. The average cost of insurance was about $13 on $1,000. It was decided to hold the next meeting at Elmira, June 12.

Georgia.

The directors of this company have resolved to issue no more free passes to members of the Legislature, editors or others. The only passes given will be to the Governor of the State, officers of other roads and officers and employes of the road when traveling on business connected with the road.

Ohio & Mississippi.

A meeting of stockholders was held in Cincinnati, Jan. 13, at which resolutions were passed charging bad management upon the officers of the company, protesting against the continuance of the present Receivers and presenting the name of Wm. D. Griswold as a fit person for the office of receiver.

New Orleans, St. Louis & Chicago.

Since the termination of the receivership of the whole road and the transfer of the former New Orleans, Jackson & Great Northern to the trustees, the section from Canton, Miss., to Fillmore, Ky., formerly the Mississippi Central, has been placed in charge of R. P. Neely as Receiver. Mr. Neely had previously been appointed Receiver of so much of the road as is in Tennessee, and on Jan. 1 took possession of the sections in Mississippi and Kentucky also.

Northern Pacific.

Mr. J. L. Hallett is contractor for the new branch or extension of the Pacific Division from Tacoma, Wash. Ter., to the Puyallup coal fields. He has already 260 men at work and will increase his force to 600 shortly.

Atchison, Topeka & Santa Fe.

A Lawrence (Kan.) dispatch says that this company has completed arrangements to build a new track from Lawrence to De Soto, on the Kansas City Branch, where its trains now use the St. Louis, Lawrence & Western track. The rental paid for the use of this 17 miles of track is now $10,000 and one-half the expenses of maintenance.

The Pacific Railroads and the Government.

The Senate Committee on Railroads has been considering a bill introduced by Senator Gordon, of Georgia, providing for the payment of fixed annual sums by the Union and Central Pacific companies as a sinking fund to provide for their indebtedness to the Government. A similar bill, introduced at the last session, is before the Senate, and the whole subject is to come up for discussion Jan. 23.

Chicago & Northwestern.

This company is building four new hotel cars to be run on its line between Chicago and Council Bluffs. In addition to the usual sleeping and day accommodations these cars have kitchens attached and are provided with all the necessary conveniences. These cars will be ready for use about March 1.

Portland & Rochester.

The city of Portland, the largest holder of this company's securities, has made application for the appointment of a receiver, and the case was to be heard at Saco, Me., Jan. 17.

The holders of the company's bonds held a meeting in Portland, Me., Jan. 15, and appointed a committee to confer with the Portland city officers and also with the directors of the company. There will probably be no opposition to the appointment of a receiver.

St. Louis & Southeastern.

The following order has recently been issued by Gen. J. H. Wilson, Receiver and General Manager:

"As considerable loss of revenue has arisen from the unnecessary delay in unloading cars carrying company freight, such as bridge timber, cross ties, lumber, iron rails, wood, sand and coal, the following rule is published for the government of all concerned.

"Cars must be unloaded within 24 hours after their arrival at destination, and the fact will be reported by telegraph to the Assistant General Superintendent.

"Heads of departments will be held responsible for the strict enforcement of this order."

North & South of Georgia.

The Receiver reports as follows for the year ending Nov. 30:

Gross earnings ($392 per mile)	$9,013 95
Expenses (96.46 per cent.)	8,681 63
Net earnings ($14 per mile)	$332 32

The shortness of the road and the nature of the country do not give any prospect for an increase of business. The Receiver thinks that the road should be extended about 12 miles beyond the present terminus, most of the grading for that distance being done. The Governor transmits the report to the Georgia Legislature with the recommendation that the State dispose of the property as soon as possible, even if it is necessary to do so at a considerable loss.

Cape Girardeau & State Line.

The United States Circuit Court has decided to remand to the Missouri State Court for the Cape Girardeau circuit the suit brought to set aside a certain mortgage on the property of this company. Some time since some of the defendants had it removed to the United States Court, but it is now returned to the State Court.

Memphis Branch.

The Governor of Georgia reports to the Legislature that he has taken possession of this road, of which only five miles are completed, the company having failed to provide for the interest on $34,000 of bonds endorsed by the State. It is now in charge of Robert T. Fouche as State Agent. The Legislature is asked to take some action with respect to the road.

New York Central & Hudson River.

On the morning of Jan. 12 a singular accident occurred at the Grand Central Depot in New York. A mass of snow and ice on the highest part of the roof became loosened by the warmth of the sun, slid off and fell upon the glass of the next section, some six feet below. The thick plates of glass were broken to pieces for about two-thirds of the length of the building, and the snow, ice and broken glass fell upon one of the inward-bound platforms below. Fortunately the platform was empty and no person was hurt, though the horses of two street cars standing there were badly cut and injured.

The line between Albany and Buffalo was worked under great difficulties during last week and the early part of the present week, owing to the heavy snow storms, which followed each other with very brief intermissions. Passenger trains were worked through with many delays, in one case a train only making 57 miles in 15 hours, and for several days freight trains were almost abandoned. In several cases stock suffered severely, and the damage to equipment must have been considerable. The four tracks of the road could not be kept clear with plows as an ordinary double track is, and much of the work of clearing the road has had to be done by shoveling, which is, of course, slow work and requires a large number of men. Some experiments are to be made with a plow especially designed for the four-track road, which is being fitted up in the Albany shops.

Macon & Brunswick.

In his recent message the Governor of Georgia states the operations of this road for the year ending Nov. 30, as follows:

Gross earnings ($1,613 per mile)	$317,829 18
Expense account (96.62 per cent.)	307,054 78
Balance	$10,774 40
Add balances due from other roads	47,701 32
Total	$58,475 72

Of these balances due $18,097.62 have been collected. The policy of the management has been to improve the condition of the road as much as possible. Proposals have been invited for the sale or lease of the road; if no acceptable bid is received some action by the Legislature will be required.

Parker & Turkey City.

It is proposed to build a narrow-gauge road from Parker, Pa., northward by way of Foxburg and Petersburg to Turkey City, about 10 miles, and it is said that the Parker & Karns City Company will iron and equip the road if the grading can be done. The road will reach the Clarion oil district, which the Emlenton & Shippenville road is being built to serve.

Oley Valley.

Meetings continue to be held in aid of this projected line from Friedensburg, Pa., to the Reading road, and committees have been appointed to secure subscriptions and to have surveys and estimates made.

Kent County.

This road, which extends from Massey's, Md., to Chestertown, 31 miles, is to be sold Feb. 15 under foreclosure of the first mortgage.

North Carolina.

At a recent meeting of the directors it was resolved to pay 6 per cent. annually on the stock hereafter. The payment will be made in two semi-annual dividends, to be paid April 1 and Sept. 1. The road is leased to the Richmond & Danville Company.

Waterville & Washington.

The formal opening of this road was celebrated by an excursion and public meeting Jan. 11. The road is 21 miles long, from Waterville, Kan., to Washington, and is worked by the Central Branch Company, of whose line it is an extension.

Wilmington & Reading.

The bondholders who bought this road at foreclosure sale have completed arrangements to organize a new company, to be known as the Wilmington & Northern Railroad Company. The meeting for organization is to be held in Philadelphia, Jan. 23.

Somers Point & Absecom.

Books of subscription to the stock of this company have been opened and a considerable amount has been subscribed. The road is to run from Somers Point, N. J., on Great Egg Harbor, north by east to Absecom, about nine miles.

Pittsburgh, Titusville & Buffalo.

The Pennsylvania Supreme Court has affirmed the decision of the Circuit Court under which the Pennsylvania Transportation Company last year obtained a judgment for about $195,000 against the Oil Creek & Allegheny Valley Company for breach of contract.

St. Croix & Penobscot.

An extension of this road from its present terminus at Princeton, Me., northward to the most convenient point on the European & North American road was proposed long since, and measures are now being taken to secure its construction.

Rutherford & Spartanburg.

A company by this name asks for a charter to build a railroad from Rutherfordton, N. C., southward to Spartanburg, S. C., about 40 miles.

Quincy & Rushville.

Citizens of Clayton, Ill., have offered to grade and tie several miles of this projected road, provided the company will agree to complete the road to their town.

Loami & Springfield.

Meetings are being held to advocate the construction of a road from Loami, Ill., northward about four miles to Bates on the Toledo, Wabash & Western. A company is to be organized to build the road.

Illinois Central.

The Land Department reports for December sales of 680 acres of land for $4,985, and cash collections on land contracts amounting to $14,564.62,

The Traffic Department reports earnings for December as follows:

	1876.	1875.	Decrease.	P. c.
In Illinois, 707 miles	$397,619 12	$508,391 97	$110,772 85	21.6
In Iowa, 402 miles	105,521 58	171,042 08	65,520 50	38.3
Total, 1,109 miles	$503,140 70	$679,434 05	$176,293 35	25.9

The Illinois earnings were $562, and the Iowa earnings $262 per mile, the average for the whole road being $454 per mile.

Indianapolis, Cincinnati & Lafayette.

A number of holders of the equipment bonds have signed a call to the trustees to take some action, the interest being in default since Sept. 1, 1876.

Port Royal.

In the United States Circuit Court a decree of foreclosure and sale has been entered against this road. The terms of sale are one-third cash and the balance in three equal semi-annual installments, secured by mortgage on the property. The amount of the bonds due is fixed at $2,500,000. The former order of sale was granted by a South Carolina Court, but the present order is substantially the same.

Hudson Tunnel.

This company has taken an appeal to the Circuit Court from the award of the Commissioners, who condemned the land taken by it in Jersey City, on the ground that the award is too high. It is said that an agreement has been concluded with the Delaware, Lackawanna & Western, that company agreeing to withdraw its opposition on condition that the Tunnel Company condemn none of its lands east of Prospect street.

New York & Oswego Midland.

The Receivers have withdrawn train service from the Ellenville Branch and removed all the property of the road which can be carried away. This action is taken on account of trouble about taxes, the Receivers believing that the branch line is assessed at too high a figure.

New York & Manhattan Beach.

Contracts have been let for the construction of this road, and it is said that work will be begun as soon as the weather

will permit. The road is to be of 3-ft. gauge and is intended for suburban and pleasure travel. It is to run from the Greenpoint Ferry, North Fifteenth street, Brooklyn, eastward to the Bushwick Meadows, thence southward to East New York and to a connection with the New York, Bay Ridge & Jamaica road, whose line will be followed to Bay Ridge, with a branch to Coney Island. The whole length of road to be built, including the Coney Island Branch, is about 18 miles.

Peoria & Rock Island.

Receiver Hilliard's report for October is as follows:

Balance, Oct. 1	$10,395 80
Receipts	30,516 17
Total	$40,911 97
Disbursements	29,972 32
Balance, Nov. 1	$10,939 65

The receipts exceeded the disbursements by $543.85.

In the United States Circuit Court in Chicago, Jan. 12, a final decree of foreclosure and sale was ordered to be entered. The sale is to be made by H. W. Bishop, Master, after due advertisement, and will include the 92 miles of road, with all the buildings and other property and the equipment, consisting of 8 engines, 7 passenger and baggage and 90 freight cars. The sale will be made subject to $150,000 bonds issued by the old Rock Island & Peoria Company, and to a contract with the Coal Valley Mining Company, under which that company is entitled to a royalty of 25 cents per ton on all coal carried over the road. The amount of the bonds and unpaid coupons is $1,756,666.66. The purchaser will be required to pay $100,000 in cash, but may pay the balance in bonds and overdue coupons.

Omaha & Republican Valley.

Butler County, Nebraska, has voted to issue $119,000 in bonds in aid of the proposed extension of this road from Wahoo, Neb., westward through the county.

Northern, of California.

This branch of the California Pacific is now completed to a point seven miles above Williams, the late terminus, and 45 miles from the junction with the California Pacific at Woodland.

Texas Western.

Trains are now running regularly to Wimberly, 30 miles west of Houston, Tex. Contracts have been let for a further section of 20 miles, which will carry the road across the Brazos River and within three miles of Belleville. The iron for this section is on hand.

Connecticut Western.

At a meeting held in Hartford, Jan. 13, the stockholders voted to approve the plan proposed for the issue of 7 per cent. preferred stock in place of the present first-mortgage bonds, the bonds to be deposited in trust, as collateral security, and the common stockholders to have the right to redeem the preferred stock at par and accrued interest. The plan really amounts to a surrender of the control of the road to the bondholders, and the acceptance by the latter of the net earnings in lieu of their interest.

Southern Pacific.

This company has lately completed a branch from Goshen, Cal., westward across the valley to Grangeville, 50 miles. It is part of the connecting link between the company's coast line and its Los Angeles line. At the terminus a new town has been established and called Grangeville.

Work has been begun on a second or loop line from San Francisco south by east to San Bruno, about 12 miles. The new line will follow the coast for the most part, will be somewhat shorter and have lighter grades than the existing line.

Bellaire & Southwestern.

A large force is at work grading this line near Beallsville, O., and tracklaying will be begun in a month or two.

New York Elevated.

This company's securities have been put on the list at the New York Stock Exchange. The statement made is as follows: Main Line from Battery Place to Sixty-first street, 5 miles; sidings, 2 miles; South Ferry Extension, nearly completed, three tracks, 0¾ mile; 14 stations, 16 engines and 34 passenger cars. The capital account is as follows:

Stock paid up	$1,050,000
Bonds sold	1,000,000
Floating debt	412,000
Required to complete South Ferry Extension	30,000
Total	$2,442,000

To pay the floating debt and improve the road the company purposes issuing $450,000 stock and $730,000 bonds, which will make the stock $1,500,000 and the bonds $1,730,000; total, $3,230,000, being $561,739 per mile of road, or $349,189 per mile of track. In October, 1876, the road earned $22,650 gross, and $10,650 net, against $11,398 gross and $4,979 net in October, 1875, an increase of 98.7 per cent. in gross, and 113.9 per cent. in net earnings.

South Pacific Coast.

The line of this road has been finally located over the Southern Division from Los Gatos to Santa Cruz. The line adopted runs up from Los Gatos to Mountain Charley's, where a long tunnel will carry it through to the head waters of Cyante Creek, then runs down the Cyante Valley to the San Lorenzo nearly opposite Felton, and down the east side of the San Lorenzo to Santa Cruz. This line is the shortest found and, with the exception of the tunnel, is said to be an easy one to build.

Erie.

The Receiver's report for October and November is as follows:

Balance, Oct. 1	$408,943 09
Receipts for October	2,210,946 32
" " November	2,055,968 01
Total	$4,675,857 42
Disbursements for October	$2,200,239 93
" " November	1,892,039 43
	4,092,279 36
Balance, Dec. 1	$583,578 06

The receipts exceeded the disbursements by $10,706.39 in October, and $163,928.58 in November, being $174,634.97 for the two months. The receipts from Receiver's certificates were $135,521.10. The Receiver reports that all arrears of wages are paid up and that the employes will be paid regularly hereafter.

New Orleans, Jackson & Great Northern.

A meeting of the consolidated bondholders is to be held in the Illinois Central office, No. 31 Nassau street, New York, Feb. 15, for the purpose of concerting measures for the purchase of the road at the approaching foreclosure sale, and for the organization of a new company. The foreclosure sale is to take place in New Orleans, March 17.

Ohio Central.

The track on this road (formerly the Atlantic & Lake Erie) is now laid to the crossing of the Pittsburgh, Cincinnati & St. Louis and Baltimore & Ohio track, 4¼ miles west of Newark, O. This crossing is 17 miles northward from Pleasantville, the last point noted, and 28 miles from the Cincinnati & Muskingum Valley Junction at Bremen. The connection at the Pittsburgh, Cincinnati & St. Louis crossing has been made, the west arm of the Y there being laid. Ties are being distributed along the line northward towards Granville and tracklaying will be resumed as soon as the weather permits.

Cleveland & Pittsburgh.

The Farmers' Loan & Trust Co., Trustee, gives notice that 16 of the construction and equipment bonds have been drawn for redemption by the sinking fund and will be paid in full, with accrued interest, on presentation at the Trustee's office in New York. Interest will cease July 1, 1877, on these bonds, the numbers of which are: 56, 449, 584, 676, 709, 711, 739, 867, 883, 888, 925, 945, 959, 960, 1100, 1342.

Indianapolis, Bloomington & Western.

In the United States Circuit Court at Chicago, Jan. 9, the Court made an order denying the petition filed some time since for the removal of Gen. Wright, the present Receiver, but granting leave to the applicants to file a new and amended petition. The new petition was at once filed and the court referred it to H. W. Bishop, Master, to take evidence in the matter.

East River Bridge.

At a meeting of the trustees held Jan. 11, the Executive Committee presented a report in favor of giving the contract for the main cables to John A. Roebling's Sons & Co., of Trenton, N. J. After considerable discussion the report was referred back to the committee with instructions to receive new proposals for cables to be made of Bessemer steel wire.

At a subsequent meeting the trustees rescinded the resolution calling for bids for Bessemer steel wire, and resolved to award the contract for wire for the main cables to J. Lloyd Haigh, of Brooklyn, at 8.7 cents, gold, per pound, for crucible cast steel wire. The whole amount of the contract is about $600,000.

New York, New Haven & Hartford.

At the annual meeting in New Haven, Jan. 10, the irrepressible stockholder, Mr. Goodwin, appeared as usual, this time with a proposition to run passenger trains on which only 2 cents per mile should be charged. President Bishop said that, including commutation tickets, the average charge was now only about 2½ cents per mile. Transient fares might be reduced to 2 cents per mile, if the stockholders would be content to take 6 instead of 10 per cent. dividends. Mr. Goodwin called for a stock vote, but objections were made and the proposition was withdrawn. Mr. Goodwin then offered some resolutions which were not considered. Another stockholder began a verbal protest against the running of trains on Sunday, but was cut short by an adjournment.

ANNUAL REPORTS.

Chesapeake & Ohio.

This company works a line from Richmond, Va., to Huntington, W. Va., 425.82 miles, including the extension to the James River wharves; the Lowmoor Branch, 2.18 miles; the Quinnimont Coal Branch, 1.05 miles, and the Coal River Branch, 1.33 miles, making 430.38 miles in all. The equipment consists of 76 engines; 29 passenger, 4 sleeping, 1 observation and 16 baggage, mail and express cars; 840 box, 103 stock, 346 platform and gondola, 669 eight-wheel coal, 254 four-wheel coal and 2 drovers' cars; 1 officers', 1 pay, 4 derrick, 137 gravel and 100 dump cars. Five engines were bought during the year and five heretofore leased were purchased.

The present report covers the year ending Sept. 30, 1876, during which the road has been in the hands of a receiver under proceedings for foreclosure of mortgage. Plans have been prepared for the purchase and reorganization of the road by the bondholders. The plan adopted provides for an issue of $18,628,578 ($43,322 per mile) of first-mortgage bonds, $10,000,000 income bonds, and $28,982,925 stock of various classes, making a total of $57,611,503, or $133,980 per mile. The existing mortgage debt, not including overdue interest, amounts to $21,744,000.

The freight tonnage for the year was as follows:

	1875–76.	1874–75.	Increase.	P. c.
Tons carried	415,462	359,569	55,893	15.5
Tonnage mileage	97,633,570	57,890,000*	39,743,570	68.6

* About.

The average haul was increased by nearly 55 miles. The coal tonnage was: 1875–76, 230,444; 1874–75, 178,510; increase, 51,934 tons, or 29.1 per cent.

The earnings for the year were as follows:

	1875–76.	1874–75.	Inc. or Dec.	P. c.
Passengers	$365,865 41	$409,626 71	Dec.. $43,761 30	10.7
Freight	1,177,942 36	993,862 50	Inc .. 184,079 86	18.5
Express and mails	53,340 87	53,247 38	Inc .. 93.49	0.2
Miscellaneous	2,363 91	2,452 89	Dec.. 88.98	3.6
Total	$1,599,512 55	$1,459,189 48	Inc . $140,323 07	9.6
Expenses	1,243,035 95	1,112,329 70	Inc .. 130,715 25	11.8
Net earnings	$356,476 60	$346,868 78	Inc .. $9,607 82	2.8
Gross earn. per mile	3,716 51	3,390 46	Inc .. 326 05	9.6
Net earnings per mile	828 28	805 96	Inc .. 22 32	2.8
Per cent. of expenses	77.72	76.23	Inc .. 1.49	2.0

The net earnings for the last year were sufficient to pay 6 per cent. on a capital account of $13,805 per mile. The decrease in passenger earnings was due chiefly to the light travel to the Virginia springs, which is attributed to the superior attractions of the Centennial. The increase in freight earnings was less than that in traffic, owing to the very low rates obtained for through freight.

Included in expenses was $88,068.53 expended for renewal of track. About 400 tons of iron and 700 tons of steel rails were laid; temporary structures were replaced by permanent ones in several places and the condition of the road generally improved. Payments for five engines heretofore leased were completed and a considerable amount paid on five new engines bought from the Danforth Locomotive Works.

Philadelphia, Wilmington & Baltimore.

This company owns a line from Philadelphia to Baltimore, 95.5 miles, with an extension, known as the Southwark Railroad, in Philadelphia, 1.75 miles; a branch from Perryville to Port Deposit 3.75 miles; the New Castle & Wilmington road, from Wilmington, Del., to New Castle, 5.5 miles, and the New Castle & Frenchtown road, from New Castle to the Delaware Railroad Junction, 6 miles, making in all 112.5 miles, of which 99.25 miles are owned directly and the rest indirectly, through ownership of stock. It also leases the Delaware Railroad, whose accounts are kept separately. The present report covers the year ending Oct. 31, 1876.

The equipment consists of 78 engines; 127 passenger, 2 parlor, 4 chair, 17 smoking and baggage, 1 postal, 25 baggage, 15 express and 3 milk cars; 683 box, 73 stock, 318 platform, 50 lime, 55 dump and 77 lumber cars; 1 pay, 3 wood, 5 tool, 2 crane and 3 construction cars, 1 snow-plow, and 1 street sweeper; a total of 194 passenger-train, 1,256 freight train and 16 service cars. The increase during the year was 6 engines, 32 passenger, 2 parlor, 1 smoking and baggage and 2 express cars; one engine was sold and one broken up and two bought to replace them.

The capital account at the close of the year was as follows:

Capital stock ($102,767 per mile)		$11,561,250 00
Convertible bonds	$265,000	
Other bonds	2,501,000	
Ground rents	10,000	
Total bonded debt ($24,676 per mile)		2,776,000 00
Dividend and interest account		132,767 20
Renewal fund		296,456 56
Balance of revenue accounts		545,382 50
Total ($136,105 per mile)		$15,311,856 26

The assets, besides road and equipment, include real estate not needed for the road, valued at $263,261.05; stocks and securities at cost, $953,836.41; Junction Railroad stock, $86,561.68; Southwark Railroad stock, $52,878.75; New Castle & Wilmington stock, $150,000; New Castle & Frenchtown stock, $150,000, Delaware Railroad stock, $443,251.62; Eastern Shore stock, $263. During the year $25,000 convertible bonds were exchanged for stock.

The locomotive mileage for the year was as follows:

	Main Line.	N. C. & W. R. R.	N. C. & F. R. R.	Delaware R. R.	Total.
Passenger	1,003,864	22,996	10,297	108,837	1,145,994
Freight	647,739	21,792	16,945	155,294	841,770
Service	43,226	1,211	527	5,608	50,572
Total	1,694,829	45,999	27,769	269,739	2,038,336

There was an increase in the Main Line mileage of 221.113 miles, or 15 per cent., and in the total mileage of 197,282 miles, or 10.7 per cent.

The earnings for the year were as follows:

	1875–76.	1874–75.	Inc. or Dec.	P. c.
Passengers	$2,358,080 10	$1,749,815 07	Inc .. $608,265 03	34.8
Freight and express	1,000,677 66	1,186,939 43	Dec.. 186,261 77	15.7
Rents	9,256 60	9,856 03	Dec.. 599 43	6.0
Mails and miscellaneous	88,121 83	99,560 55	Dec.. 11,438 72	11.5
Total	$3,456,136 19	$3,046,171 08	Inc .. $409,965 11	13.5
Working expenses	1,757,091 45	1,723,485 86	Inc .. 33,605 59	1.9
Taxes, State and local	77,790 77	82,381 63	Dec.. 4,590 86	5.6
Total	$1,834,882 22	$1,805,867 49	Inc .. $29,014 73	1.6
Net earnings	$1,621,253 97	$1,240,303 59	Inc .. $380,950 38	30.7
Gross earnings per mile	30,721 21	27,077 00	Inc .. 3,644 21	13.5
Net earnings per mile	14,411 15	11,025 00	Inc .. 3,386 15	30.7
Per cent. working expenses	50.84	56.58	Dec.. 5.74	10.1
Per cent. expenses and taxes	53.09	59.28	Dec.. 6.19	10.4

These earnings and expenses were divided as follows.

	Earnings.	Working expenses.	Net earnings.	Earn. per mile.	P. c. of exps.
P., W. & B. R. R.	$3,305,437 87	$1,651,602 63	$1,653,835 21	$32,727	49.97
New Castle & Wilmington	81,887 19	57,321 03	24,566 16	14,889	70.00
New Castle & Frenchto'n.	68,811 13	48,167 79	20,643 34	11,469	70.00
Total	$3,456,136 19	$1,757,091 45	$1,699,044 74	$30,721	50.84

The increase in passenger receipts on the Main Stem alone was $603,909.07. This great increase was due entirely to the large travel to the Centennial Exhibition at Philadelphia. The decrease in freight earnings was due partly to a reduction of rates and partly to the light fruit business from Delaware. This fruit traffic for five years past was as follows:

	1876.	1875.	1874.	1873.	1872.
Car-loads peaches	2,117	9,072	1,266	2,853	4,091
Car-loads berries	882	905	714	688	565
Total car loads	2,999	9,977	1,980	3,541	4,656
Weight in tons carried	24,455	92,068	18,102	32,560	38,466

The revenue from this source was 60 per cent. less than in the previous year. It will be seen that the peach traffic is extremely variable, but that in small fruits is much steadier.

The income account may be summed up as follows:

Balance from 1875		$538,608 23
Net earnings		1,621,253 97
Total		$2,159,682 20
Balance of interest account	$15,234 00	
Depreciation of materials on hand	15,756 48	
Subscription to Centennial stock, balance	18,000 00	
Loss on Delaware Railroad lease	25,693 09	
Improvements and new equipments	365,836 13	
Renewal fund	250,000 00	
Dividends, 8 per cent	923,960 00	
		1,614,479 70
Balance, Nov. 1, 1876		$545,382 50

The balance of interest account is obtained by deducting interest on securities, etc., received from that paid. The improvements made consisted in new stations, new fencing, new sidings, additional right of way and tracks on the Darby Improvement, block signals, and chiefly in the new freight house and in improvements of the passenger house in Philadelphia. The new equipment was made necessary by the Centennial travel. Expenditures from renewal fund, chiefly for the Susquehanna and Big Elk bridges, were $139,259.66.

The usual course of the company has been to charge all improvements to expenses; this year, however, so large an amount was expended, that it was considered only just to charge part of it to construction account.

During the past year 785 tons of steel rails were used in renewals, leaving only 13 miles of iron track in the Main Stem, which will be relaid with steel during the current year. The property is left in good condition after the heavy passenger traffic of the year, which was very successfully handled by the officers of the road.

The Delaware Railroad lease has been renewed for 21 years, with this change, that the rental, which has been heretofore 30 per cent. of gross receipts, is to be hereafter 6 per cent. on the stock and debt of the Delaware Company. Should the net earnings in any year be insufficient to pay this, the deficiency is to be a charge against the future earnings.

The report is accompanied by a map of the road, a plan of the new stations in Philadelphia, and by views of those stations and of the new round-house in Wilmington.

Trial of Atmospheric and Vacuum Brakes.

Owing to the great increase of the speed of railroad trains and from other causes, the importance of efficient train-brakes has during the last few years attracted a great deal of attention in England. A little more than a year ago arrangements were made by the Railway Companies' Association of England for a series of trials of continuous train brakes. These trials were made under the auspices of that Association for the purpose, as stated by *Engineering*, of eliciting information for the "public generally and railway companies in particular, and of affording information to the Royal Commission now inquiring into railway accidents and the means of their prevention." An

account of these trials was published in the *Railroad Gazette* of July 3 and 10, 1875. For some unexplained reason, the Royal Commission have never issued their report of these trials, and as stated in *Engineering*, "some two months ago, Mr. D. Drummond, Locomotive Superintendent of the North British Railway, having determined to settle to his own satisfaction the vexed claims for superiority put forward by the automatic and the vacuum representatives, gave to each a similar train which was to be equipped in the completest and most perfect manner."

"This train consisted of a four-wheeled coupled inside cylinder engine, with a two-wheeled Adams bogie under the leading end, the total weight being 36 tons; a tender weighing in running order 20¼ tons; eight carriages; two vans borrowed from the Great Northern Railway, fitted with pumps to assist the brakes, and weighing nearly 27 tons, and the experimental van containing the recording apparatus, weight 9 tons 14 cwt. * * In the experimental van was placed a table carrying the indicating apparatus, speed gauge, &c. On one side of the van was attached an electric signalling instrument, a similar one being placed on the engine, and communication was established between the two. A gauge for recording the variations of pressure in the brake pipe was also in the van. As soon as any given speed, previously decided upon, was reached and indicated upon the speed gauge, the signal was given through the wire from the van to the engine, the brakes being applied at the same moment that a return signal intimated the fact to the operator in the van. As soon as this return signal was heard, the time taken to bring the train to a stop was ascertained by a chronoscope, and two diagrams were taken by Richards' indicators adapted for the purpose, the one showing the speed of the train at the moment when the brakes were applied (thus checking the speed gauge), the distance run before the train was stopped, and the retarding influence of the brakes throughout the period of their application. The diagrams taken by the second indicator showed the distance run before the full power of the brake was developed, while the time required for the brakes to be set on at the rear of the train was obtained by a second observer with a chronoscope, who recorded the number of seconds and quarter seconds that elapsed, from the falling of the brake pressure gauge to zero, to the stopping of the train. This period deducted from the time taken in stopping, reckoned from the first stroke of the electric signal given from the engine, gave the time required to set on the brakes throughout the train. Of course this latter observation could only be made when the experimental van was at the tail of the train; the loss of time recorded varied from three-quarters of a second to one second and three-quarters."

[A detailed description of the Westinghouse train indicators was published in the *Railroad Gazette* of Oct. 6 of last year.]

"The total weight of train, including passengers, was officially given as 173 tons. There were in all 60 wheels in the train, all carriage and van wheels being 4 ft. in diameter, engine wheels 6 ft. 5 in., and bogie wheels 2 ft. 9 in. All the vehicles excepting the two Great Northern vans were on four wheels; the latter had six. Brakes were applied to every wheel throughout the train, except on those of the engine bogie and of the experimental van, equivalent to a weight of 21 tons, so that 87.88 per cent. of the weight of the train could be controlled by the brakes. There were in all 54 brake blocks, 42 of iron, and 12 of wood, all having a contact surface of 16 in. The wooden blocks were fitted to the Great Northern vans, which were equipped, as has been already stated, with auxiliary appliances. It may be mentioned here that these pumps are not considered as forming part of the brake system, and those used in the trial had been employed on the Great Northern Railway simply for experimental purposes. On that line, indeed, where vacuum brakes are being partially fitted up, such appliances are not used. On the other hand they greatly assist the action of the ejector in promoting the promptness of the stop. It is somewhat to be regretted that no trials were made with this train without the action of the pumps in the van, as the stops recorded were in consequence more favorable than can be obtained by the brake as fitted in practice. Sandboxes, moreover, were placed in the van to facilitate stopping. The pumps are oscillating, and are driven off an axle of the van by a friction pulley, which works gearing that actuates the pumps. In one van the pumps are started by an independent rubber bag, which, as soon as it begins to contract from the exhaustion of the air, moves a lever and throws the driving wheels of the pump motion into gear. The guard of the train can put on these auxiliaries, independent of the driver, and the latter can also put them on from the engine, but cannot release them. The average size of the rubber bags in the train was 15 in. by 24 in., and the brake rigging was arranged with a leverage of $6\frac{1}{2}$: 36.

"Two ejectors were fitted to the engine, one large double ejector for working the train and a single ejector for the engine. A large portion of the steam was exhausted up the chimney, and no fall of boiler pressure was observed during the application of the brake."

The following account of the trial is quoted from *The Engineer*:

According to the programme drawn up by the committee it was intended that the experiments should begin with the vacuum brake on the morning of Tuesday, the 12th of December. As we have already stated, it was proposed that a double run should be made with each train from Waverley Station, Edinburgh, to Cowlairs, and back to Edinburgh, a total distance of about ninety-five miles. The road is, as will be seen from the section on the next page, nearly a dead level.

It was found, however, that the Smith vacuum brake train was not ready at the appointed hour, and the Westinghouse train made the first trip. The preliminary run from Edinburgh to Glasgow was employed in getting the Westinghouse recording apparatus into order, and, we may add, in adjusting the electrical apparatus communicating between the "experimental van," as it was called, and the engine-driver, and in training the numerous observers who took the time with chronoscopes. Several stops were made with highly satisfactory results, but the committee decided to reject them all, and start afresh from Cowlairs. On the run back probably one of the most complete sets of experiments on record was made with the Westinghouse brake, and the results obtained we shall give at the proper time. Meanwhile it must suffice to state that the gross retarding effect of the brake amounted to from 16 to 18 tons, and that the greatest distance run by the train after the application of the brakes was 366 yards only, the speed being 56.5 miles an hour, and the time 24¾ seconds. On the return of the train to Edinburgh it was found that, as we have already explained, the Smith train was not ready, and all further trials had in consequence to be postponed until Friday, the 22d inst.

Mr. Westinghouse, meanwhile, pointed out to the committee that to make the trials perfectly fair it would be requisite to test both brakes on the same day, so that the weather and the condition of the rails might be alike for both, and to this the committee agreed. On Friday last, consequently, both trains were ready, and the operations of the day commenced by running the Smith train from Cowlairs to Edinburgh and back. The Westinghouse train then made one run to Edinburgh. For convenience of reference, we give a brief summary of the results here:

Table Showing the Relative Efficiencies of Automatic and Continuous Brakes, at Intervals of 100 ft., from Moment of Application to Stopping Train.

No. of Stop.	Train Speed in Miles per Hour when Brake was applied.		Train Speed after Brake had been applied over 100 ft.	200 ft.	300 ft.	400 ft.	500 ft.	600 ft.	700 ft.	800 ft.	900 ft.	1,000 ft.	1,100 ft.	1,200 ft.	1,300 ft.	Total Distance Run.	Time.		Remarks.
																ft.	sec.		
7	40	+	40	38¼	37½	34	30	25½	18	.....	.....	.....	.....	.....	.....	800	22½		
8	44½		44	43	41½	39	36¼	32	28	22½	12½	.....	.....	.....	.....	950	24	Smith Vacuum.	
9	45		44¾	44¼	43	41½	38½	35½	31¾	27	21½	11	.....	.....	.....	1,020	25½	Glasgow to Edinburgh	
10	49½		49¼	49	48	46¾	43¼	41¼	38	34	29¾	24	16	.....	.....	1,170	27¼		
12	46½		46¼	45½	44	42	39¾	37	33	28	22½	14½	.....	.....	.....	1,050	26		
13	49		48¾	48¼	47½	46¼	43¼	40¾	37½	33¼	28¼	22½	12½	.....	.....	1,138	26½		
2	29½		29½	27¼	23¼	17½	.....	.....	.....	.....	.....	.....	.....	.....	.....	480	17¼		
5	40		39¾	38¼	36	32½	27½	22	15	.....	.....	.....	.....	.....	.....	740	20¼	.....	Diagram shows application of brakes before indicator was started.
6	40		39¾	39½	38¼	36¼	32½	28	22½	16¼	.....	.....	.....	.....	.....	860	23		
7	49½		49¼	49	49¼	47	44	42	38¾	35	30	25	18	.....	.....	1,175	26	Smith Vacuum. Edinburgh to Glasgow.	
9	49½	+	49¼	48¾	48	46¾	44¼	42¼	38½	35	31	26	20	.....	.....	1,195	27		
11	55	—	54¾	54	53	52	50	47½	45	42	38¼	35	30½	25	17½	1,375	28		
12	54		53¾	53½	52¼	51¼	48½	46¼	43	39¾	36¼	32	26¼	18¾	8	1,310	28		
13	40½		40½	39¾	38	36	32	27	21½	12	.....	.....	.....	.....	.....	830	23		
14	40		39¾	39	38	35	31¼	26½	20½	10	.....	.....	.....	.....	.....	810	22½		
15	49½	+	49½	49¼	48¾	48	46¾	44¾	42	38½	35	30½	24	15½	.....	1,250	27	.....	Not as promptly put in action, as compared with the other stops.
2	30		29	24	16½	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	350	13		
3	30	+	28¼	22	13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	328	13		
4	40		39¾	37	33	25¾	16½	.....	.....	.....	.....	.....	.....	.....	.....	550	16		
5	40	+	39¾	36½	31¼	25½	17	.....	.....	.....	.....	.....	.....	.....	.....	550	16		
6	49¾		49½	47½	43½	40	35	28½	21	.....	.....	.....	.....	.....	.....	798	19		
7	50	—	49¾	48	43¼	38	33¼	27¾	20	.....	.....	.....	.....	.....	.....	777	18¾	Westinghouse	
8	31		29¾	23½	16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	345	12¾	Automatic.	
9	30		30	26½	20	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	410	14½		Diagram shows increasing speed for 75 ft. Brake not so prompt in action as compared with other stops.
10	55		53¾	52	48	43	39	35	28	20	7	.....	.....	.....	.....	910	21	Glasgow to Edinburgh	
12	54		53¼	52	48¼	44¾	40½	36½	30	23	15	.....	.....	.....	.....	952	21		
13	56	—	55	53¼	51½	48¼	45	41½	38	34¾	28¼	23	17½	.....	.....	1,172	26	.....	Steam kept in engine in working notch.
14	54		53½	52	49	46½	43¼	40	37¼	32½	28½	22	14	.....	.....	1,158	26¼	.....	Steam on in full stroke.

Smith's Vacuum Brake.

FIRST SERIES—GLASGOW TO EDINBURGH.

The first six trials were imperfectly observed, and the results obtained were not recorded.

No. of trial.	Miles per hour.	Distance run in feet.	Time in sec.
7	40	800	22.5
8	44.5	950	24
9	45	1,020	25.5
10	49.5	1,170	27.25
11	50	Not taken.	26 ?
12	46.5	1,050	26
13	49	1,138	26.5
14	Not taken.	Not taken.	Not taken.
15	39	Not taken.	26.5
16	Not taken.	Not taken.	Not taken.

SECOND SERIES—EDINBURGH TO GLASGOW.

No. of trial.	Miles per hour.	Distance run in feet.	Time in sec.
1	30	Not taken.	21
2	29.5	480	17.75
3	Not taken.	Not taken.	Not taken.
4	39	Not taken.	20
5	40	740	20.5
6	40	860	23
7	49.5	1,175	26.75
8	48	Not taken.	23
9	49.75	1,195	27
10	Not taken.	Not taken.	Not taken.
11	55	1,375	28
12	54	1,310	28
13	40.5	830	24
14	40	810	22.5
15	49.5	1,250	27

Westinghouse Automatic Air Brake.

No. of trial.	Miles per hour.	Distance run in feet.	Time in sec.
1	..	Not recorded.	..
2	30	350	12.5
3	30	328	12.5
4	40	550	16
5	40	550	16
6	50	798	19
7	50	777	18.75
8	31	345	12.5
9	30.5	410	14.5
10	55	910	21
11	55	No diagram.	20.5
12	54	952	21
13	56	1,172	26
14	54	1,158	26.25

During the trial No. 13, the engine had steam on in the 2d notch, and in No. 14 the engine was under full steam and in full gear.

It must be understood that the value of a brake in cases of emergency depends wholly on its promptitude, and the figures which we give above really convey but an inadequate idea of the relative merits of the two brakes in this respect. We, therefore, desire to call special attention to the extended table which we give at the end of this article. A study of this will, we think, repay our readers. The great feature of merit about the Westinghouse automatic brake is that the power is all stored up beneath each carriage, ready for instantaneous application. No process has to be gone through before it is applied. Now, in the case of the Smith vacuum brake, a vacuum has to be made before the brakes can go on. In a word, all the air bags have to be exhausted by the action of a jet of steam in the first instance. Now it is well known that the rate of exhaustion varies in a kind of geometrical ratio. Thus, for example, if we suppose that half the air which it is possible to take out of the bags is consumed in the first second, then only half the remainder will be taken in the second second, and half the remainder in the third second, and so on. Thus, let the possible vacuum be 20 in. Then, if in the first second we get 10 in., in the second second we shall get 5 in. more, in the third second 2½ in. more, and so on. These figures do not give precisely the results obtained in practice, be it remembered; but they indicate the nature of a principle, which renders the obtaining of the best obtainable vacuum a comparatively slow process. Precisely the converse of this takes place with the Westinghouse brake in filling up the air reservoirs; that is to say, if the pressure is doubled in one minute, two minutes will be required to double it again, or three in all; and four minutes to double it again, or seven in all. Here, again, it must be understood that we are not dealing with practical figures, but simply illustrating a principle. It might be assumed that if this principle operates in both cases, Westinghouse gains nothing over Smith. This is not the fact, as will be understood in a moment if we bear in mind that the Westinghouse air pump fills up the reservoirs while the train is running, and to all intents and purposes does not act while the brakes are being put on; while the Smith pumps—otherwise ejectors—do not act at all while the train is running, and only operate while the brake is being applied. The practical result is shown by our table. There is no reason to doubt that the vacuum brake holds a train or retards the wheels just as effectually as the automatic brake, *once it is in action*, but the automatic brake has nearly finished stopping a train before the Smith brake begins. Take, for example, run No. 12, vacuum brake, second series, and compare it with Westinghouse, No. 12. The speeds were, in both cases, 55 miles an hour; but in the first case, after the train had run 100 ft., its speed was 53¾ miles; 200 ft., 53¼ miles; 300 ft., 52¼ miles; 40 ft., 51¼ miles; 500 ft., 48½ miles; and 600 ft., 46¼ miles. But with the automatic brake, after the train had run 100 ft., its speed was 53¼ miles; 200 ft., 52 miles; 300 ft., 48¼ miles; 400 ft., 44¾ miles; 500 ft., 40½ miles; and 600 ft., 36½ miles. Our readers have only to refer to the table for numerous examples of this truth. But the bare figures give no adequate idea of the importance of the retardation effected. For the moment we shall deal only with round numbers, and we shall assume that the weight of the two trains was the same, which assumption, although not correct, does not, it will be seen, affect the question we are now dealing with. The stored-up energy in a train represents its smashing power in case of collision. Let us suppose, then, that vacuum and automatic brake trains, weighing 200 tons, are running at 55 miles an hour, and that an obstruction is seen at a distance of 600 ft. ahead. According to our table, the automatic train would run into this obstruction at 36½ miles an hour, while the vacuum train would run in at 46¼ miles. The foot-tons in the Westinghouse train would be 8,850, and in the Smith train 14,150. That is to say, more smashing force to the extent of 5,300 foot-tons would be left in the Smith vacuum train than in the Westinghouse automatic brake train, other things being equal. We do not think we need waste space in pointing the moral conveyed by such a tale as this.

As regards the trains, very little need be said at present that is not contained in the following table, except that during the first series of experiments the total weight of the Westinghouse train, locomotive and all, including passengers, was 157 tons. On the second trial a heavy carriage was added at the rear end of the train to show a most ingenious gas lamp invented by Mr. Westinghouse, of which we shall have more to say by and by. This brought the total weight up to 167½ tons. The weight of the vacuum train was 170½ tons about.

Weights of Trains.

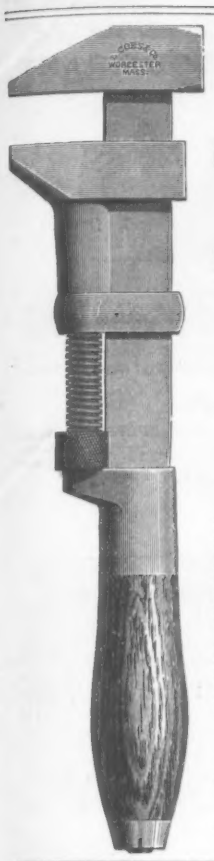
	Westinghouse. Unbraked.	Westinghouse. Braked.	Vacuum. Unbraked.	Vacuum. Braked.
Engine. Bogie	13	....	11¼	....
Engine. Drivers	....	25	....	24¾
Tender	....	21½	....	20½
Vans and coaches	20¼	84¾	9¾	101¼
Passengers	1	2	1	2
	34½	133½ = 167½	22	148½ = 170½
Percentage of weight unbraked	20.45		12.90	

No. of Brake Blocks.

	Westinghouse. Cast iron.	Vacuum. Cast iron.	Vacuum. Wood.
Engine	4	6	..
Tender	6	4	..
Vans and carriages	36	32	12
Total	46	42	12 = 54

	Tons.	Cwt.
The weight of each first class is	10	10
" " second class is	8	11
" " third class is	8	15
" " van is	9	14

We have explained that Mr. Smith gets his vacuum by steam ejectors; but to help the ejectors he used two air pumps in each van. Two of these were oscillating, of cast iron, and weighed about 11 cwt. The other two were india-rubber bags. By a very ingenious apparatus, these pumps are thrown into gear the instant the brake is applied. On the leading axle, as we may call it, of each van, is keyed a grooved friction wheel, 15¼ in. in diameter; into which gears another friction wheel 22½ in. diameter, on a swinging axle, which axle carries two eccentrics, which work the above named suckers. All the wheels of the carriages and vans are 4 ft. diameter. The india-rubber bags are 15 in. diameter, by 18 in. stroke, and we believe the air pumps are of the same dimensions. The guard can put these "suckers" on, but cannot take them off. They can be put on or off by the engine-driver, and they also operate automatically. It was found to be impossible to run without them on Friday last, and so no one is in a position to say of how much or how little use they may be. On Saturday the committee endeavored once more to run with their pumps out of gear, but as it snowed heavily the attempt ended in failure, which is very much to be regretted, as no one knows how much the efficiency of the system is due to these suckers. The way in which the brakes are applied to the wheels will be understood at once from the small diagram on preceding page. The proceedings were brought to a close on Friday by a dinner, given in the board-room of the Waverly station, to the gentlemen who had been present. During the dinner, both Mr. Westinghouse and Mr. Yeomans—the latter representing Mr. Smith—expressed their satisfaction with the arrangements of the North British Railway Company, and it was announced that Mr. Maclaren, the General Manager of the line, would take charge of both trains, and carefully note their performance for the guidance of the company.



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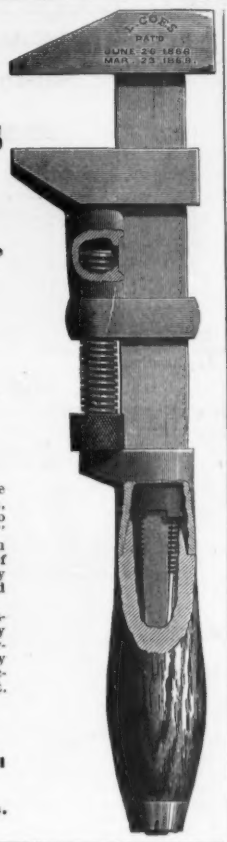

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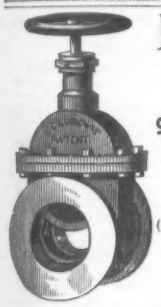

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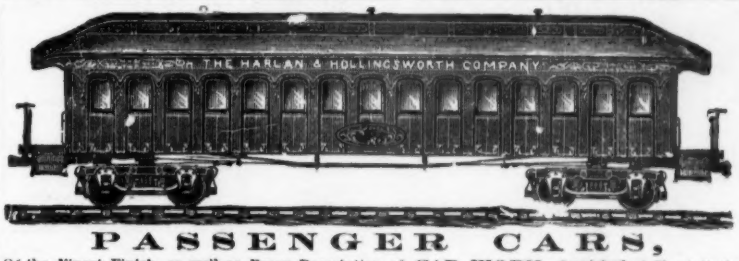

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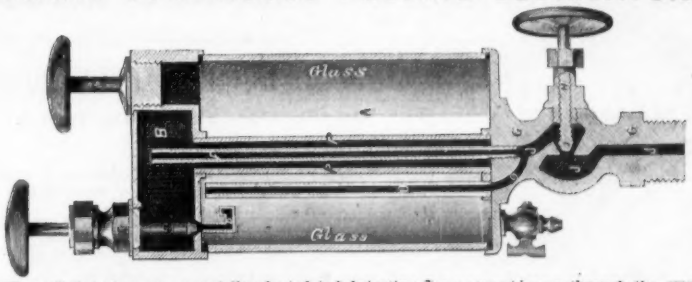

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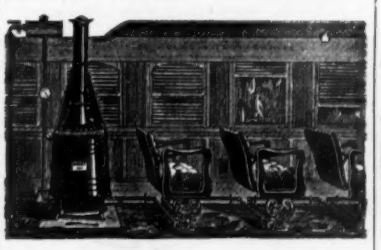

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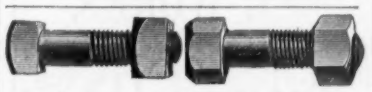

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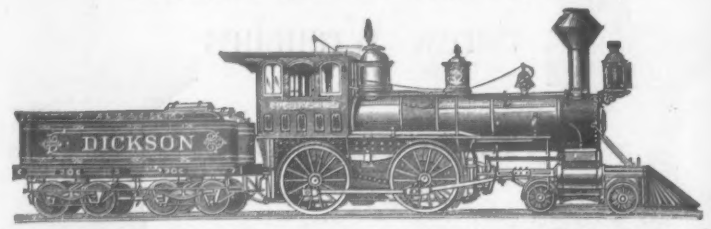

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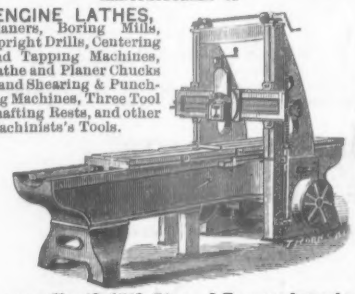

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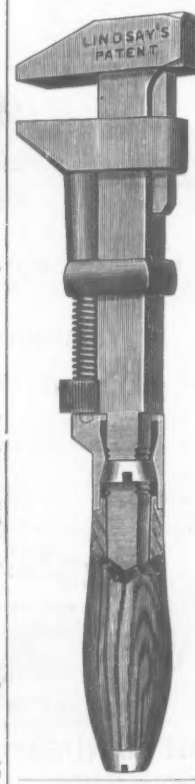

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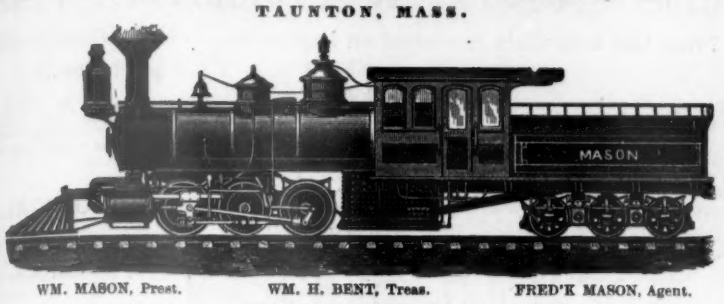

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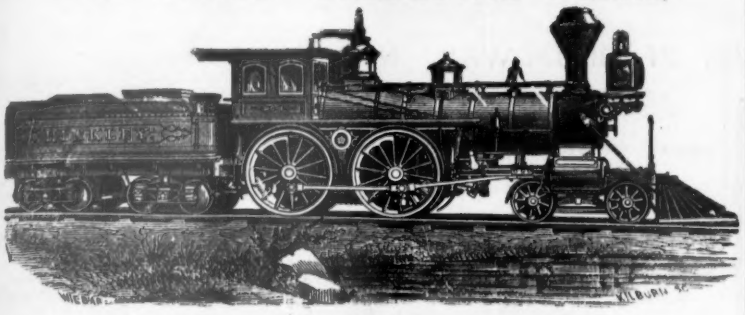

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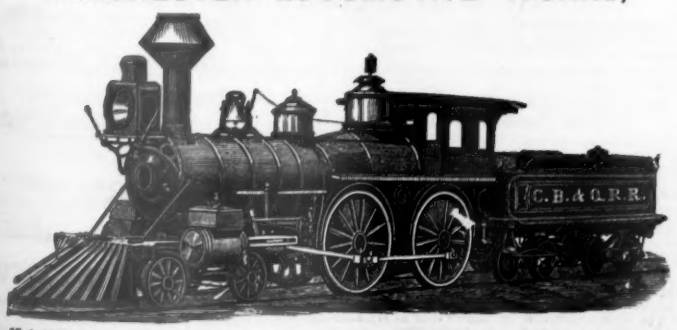

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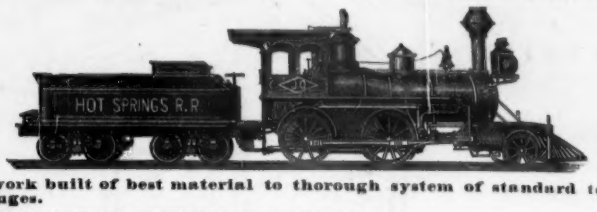

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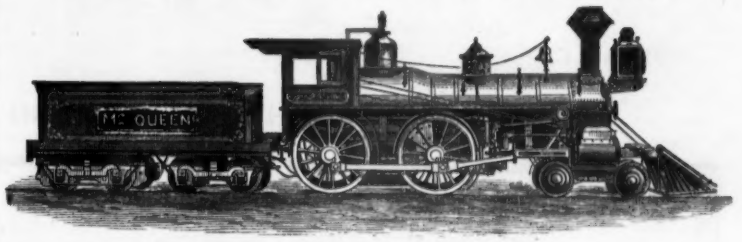

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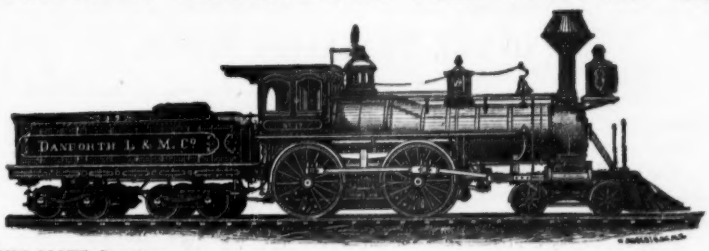

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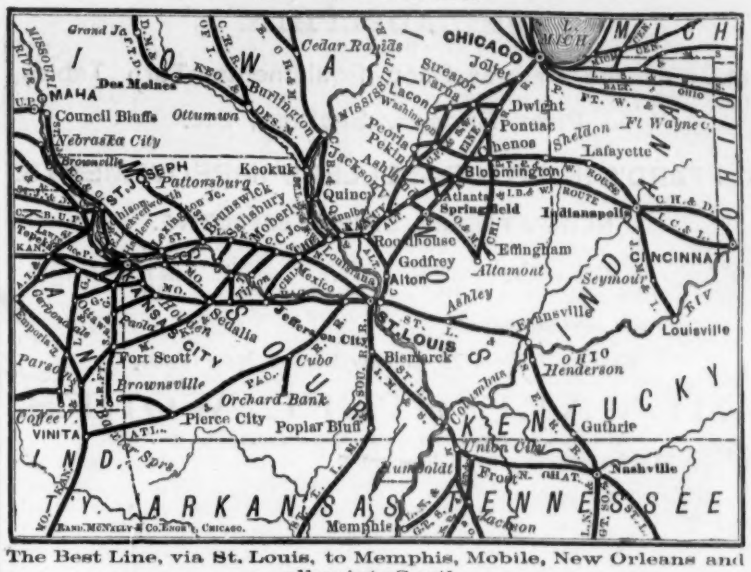

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8.30 P. M. NIGHT EXPRESS. Sundays excepted. Arriving at Gibson 12.30 A. M.; Farmer City 1.55 A. M.; Clinton, 2.38 A. M.; Springfield, 4.35 A. M.

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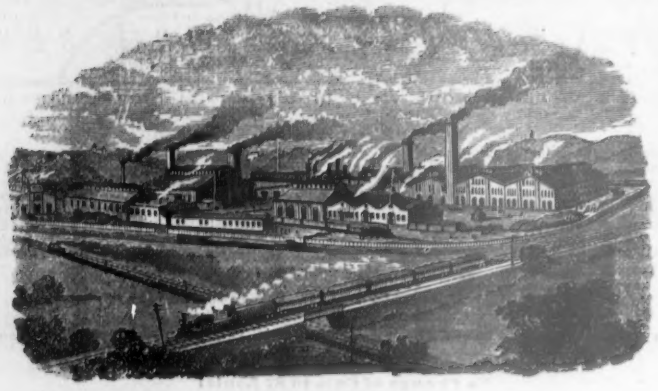

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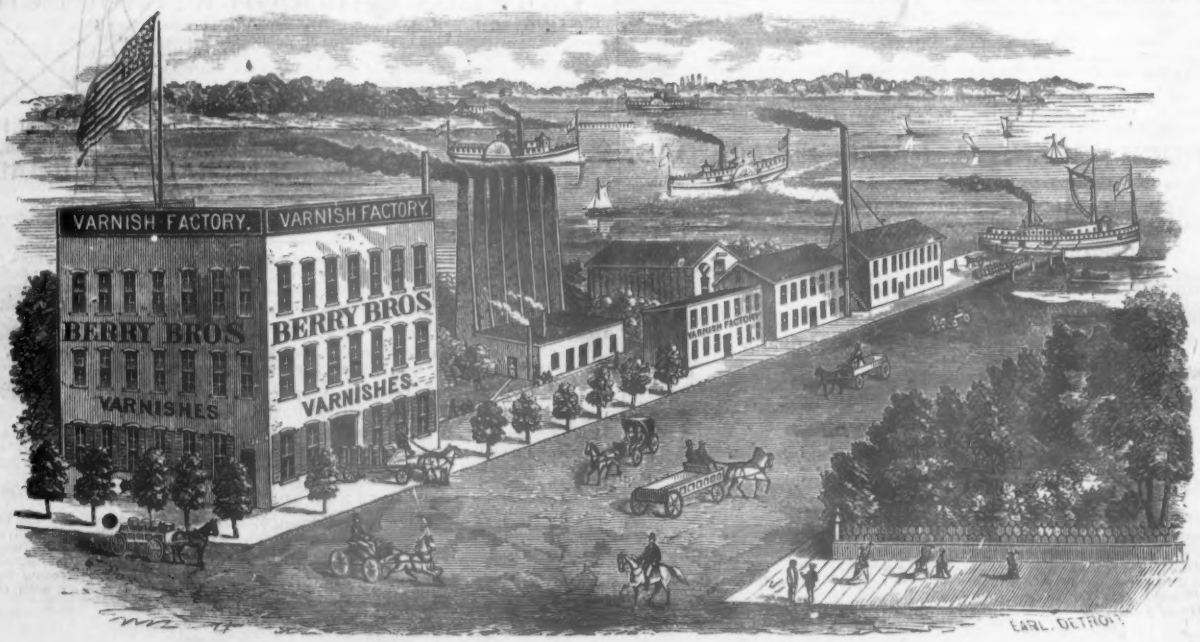

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